Aquatic Bird Count Sites and Procedures for Nevada

Great Basin Bird Observatory Technical Report No. 04-02

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REVIEW DRAFT of 20 April 2004


Continental Lake
Duck Valley Wetlands
Wildhorse Reservoir
NW Nevada Lakes and Playas
Quinn and Little Humboldt Rivers
Upper Humboldt River
SnowWater & Goshute Lakes
S. Fork Reservoir
Rye Patch Reservoir
Lower Humboldt River
Ruby Valley Complex
Pyramid Lake
Humboldt Sink
Lahontan Reservoir
Lahontan Valley
Washoe Lake
Mason Valley WMA
Steptoe WMA
Artesia Lake
Carson Valley
Walker Lake
Topaz Lake
Kirch WMA
Key Pitman WMA
Pahranagat NWR
Lower Virgin River
Ash Meadows NWR
Overton
Lake Mead
Las Vegas Wash / Henderson Sewage Plant
Lake Mojave
Lower Colorado River

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I. Summary

This report is intended as a foundation for a comprehensive sampling plan for Nevada's aquatic birds, which include waterfowl, waterbirds, shorebirds, marshbirds, and some landbirds. This group includes 73 focal species for the Great Basin region and 60 for the Mojave region of Nevada. We divided the state into four sampling strata, representing 25 distinct wetland sites and areas with indistinct dispersed wetlands. For each site, factors affecting access and detectability of birds are discussed and potential survey methods are identified. Aerial surveys and reconnaissance flights will likely play an important role in surveying Nevada's aquatic birds, because many sites are remote, ephemeral, and subject to significant year-to-year variation based on water availability. Ground surveys that involve the use of spotting scopes are recommended for those sites that can be safely accessed and are small enough that complete counts can be conducted from the shoreline. Motorized boats are recommended for sites that are too large, too complex, or too inaccessible to be surveyed from the shoreline. Shallow, intricate sites may need to be surveyed using non-motorized boats. At least five of the 25 distinct sites were identified as too complex to be surveyed completely, and for these, a sampling plan needs to be developed that allows reliable extrapolation from subsamples to estimate size of aquatic bird populations. Some sites may need pilot studies to work out final survey strategies, particularly in cases, where little previously collected information is available.

II. Background

The North American bird conservation initiatives for waterbirds, waterfowl, shorebirds, and landbirds, and the states are currently cooperating to develop Coordinated Bird Monitoring (CBM) plans in Canada and the United States (Bart et al. 2003). One element in the approach is a detailed description of sites at which aquatic birds congregate at any time of year. "Bird monitoring regions" provide the basis for aquatic site descriptions and are generated by intersecting the boundaries of Joint Venture's Bird Conservation Regions (BCRs) with those of states or provinces, smoothing the borders, and eliminating small polygons. Sampling plans and survey results for these regions within states can then be stepped up to the state and BCR level. Nevada is covered by two bird monitoring regions (Fig. 1), BMR 93 (Nevada - Great Basin) and BMR 94 (Nevada – Mojave).

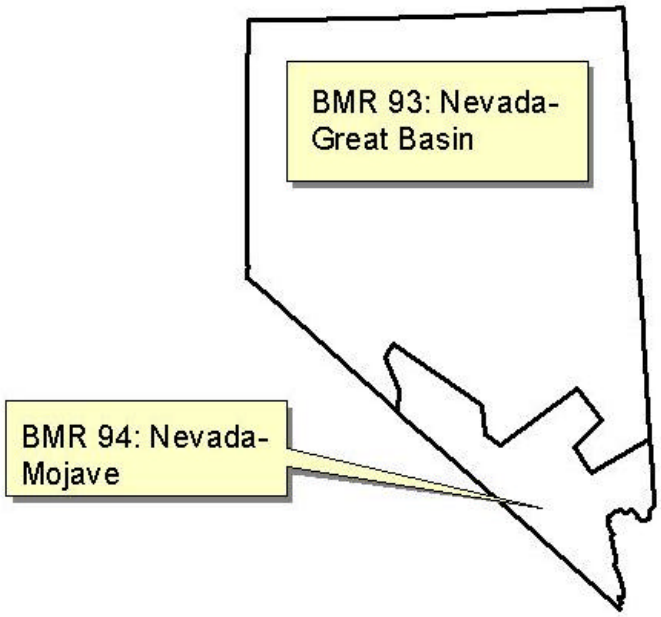


Figure 1. Bird monitoring regions in Nevada.

The first step in producing the report for each region was to identify the "focal aquatic species." The list includes all aquatic bird species that occur in sufficient abundance that surveying them in the region will provide substantial assistance in addressing monitoring goals identified at the continental, regional, or local level. The list were prepared by examining a list of species that warrant monitoring in Canada and the United States (Bart et al. 2003) and eliminating species that do not occur in the region. The lists will be used for reporting what fraction of the species that warrant monitoring efforts in the region can be covered by a proposed monitoring program. In addition, species of particular concern in a region may require inventory and short-term monitoring to define their habitat needs and guide conservation efforts. For the aquatic site description, we tried to identify sites and critical habitat areas within a site for focal species in each major season (breeding, migration, winter).

The second step was to partition the region into two or more "strata". The first stratum in each region includes all of the "designated sites" - sites at which aquatic species concentrate in sufficient abundance that they should be surveyed on a regular basis as part of a comprehensive aquatic species monitoring program. Survey needs in the remainder of the region, which we refer to as the "matrix", were then described. In some areas, the prairie potholes for example, the matrix is much more important than the designated sites. In Nevada, the designated sites are probably more important. In the Nevada-Great Basin BMR, we distinguished two matrix strata, NW Lakes and Playas and N-Central Nevada. In the Nevada-Mojave BMR we treated all of the matrix as one stratum, Southern Nevada. The description of survey needs in the matrix strata will be provided in the next planning step, because a sampling plan needs to be identified after monitoring objectives for these areas (e.g., long-term abundance monitoring vs. a short-term assessment) are identified.

The third step was to describe each designated site. The following items were discussed:

1. Boundaries and ownership
2. Focal species using the site and timing of use
3. Location of critical habitat within the site
4. Access to critical habitat and visibility of the birds
5. Past and current surveys
6. Potential survey methods
    a. Description
    b. Selection bias
    c. Measurement error and bias
7. Pilot studies needed

Site boundaries are depicted on maps and ownership is described to identify who needs to be contacted before conducting surveys. Focal species that occur, or are suspected to occur, are discussed for each site in order to determine which seasons and survey methods need to be emphasized.

Critical habitat for focal species within a site is categorized as either Type I (high-use) or Type II (moderate-use) habitat. Type I habitat should be sampled intensively using a well-defined sampling plan. Type II habitats will be surveyed with less formal methods every few years to confirm continued low use by focal species. Type III habitats (no-use areas) will not be surveyed as part of the monitoring program, but will be tracked loosely through incidental visits to detect fundamental changes in bird use over time. Type I habitat is defined as areas that have least 75% of the bird-use days within any given period, Type II habitat has no more than 20% of the bird-use days, and Type III habitat has no more than 5% of the bird-use days. If bird use is distinctly different at different times of year, then season-specific delineations of habitat types may be necessary.

Past and current surveys are summarized to assess what is already covered by ongoing efforts, to determine opportunities to integrate these efforts into a regional monitoring plan, and to make designs of future surveys compatible.

In the description of potential survey methods, the best approaches to estimating number of individuals present at a given site are discussed, both in terms of field and statistical methods (e.g., complete count using area search methods; density estimation using distance methods). Two types of possible problems in estimating numbers present and population trend are discussed: (1) Selection bias describes systematic under- or over-estimation of populations based on where surveys can be conducted. Most often, selection bias is a result of access problems, either because permission to access is not granted everywhere, or because remoteness and logistical problems prevent even coverage. (2) Measurement error (inaccurate estimation) and bias (systematic under- or over-estimation) refer to problems associated with the survey method itself. Most often, measurement error and bias have to do with problems detecting some species, either

because they are secretive or because habitat condition reduces their detectability, and with problems identifying species correctly, i.e. observer skill variability and logistical problems influencing identification (e.g., distance from shore, flying over in aircraft, flushing of birds).

The section on "pilot studies needed" identifies whether or not additional information should be collected before monitoring can begin in a given site. In many cases, this is necessary if it is unclear how much critical habitat exists, for which focal species, and how habitat is distributed within the site. In some cases, it may also be necessary to use a pilot study to develop survey strategies for particularly difficult-to-survey taxa.

III. Introduction to the Nevada Plan

Despite being located in the high desert, Nevada supports key populations of aquatic bird species. For example, during migration, Walker Lake in Mineral County has the largest inland concentration of Common Loons and provides migration habitat for a variety of other waterbirds. Significant breeding populations of White-faced Ibis, American Avocets, and Long-billed Curlews are found in playa wetlands throughout the central Great Basin, for example along the Humboldt River and its tributaries, Ruby Marsh, and Franklin Lake. Lahontan Valley of Churchill County contains the Carson River's historic terminal marsh that is still maintained by water allocations from the Newlands Project, which brings irrigation water from the Truckee River to the Fallon agricultural areas. As a result, Lahontan Valley has perhaps the most complex wetland system that remains in Nevada and provides such a significant migration stopover site for shorebirds that it is recognized as part of the Western Hemispheric Shorebird Reserve Network. Anaho Island, located in Pyramid Lake of the Pyramid Lake Paiute Reservation, supports one of the two largest breeding colonies of American White Pelicans in North America.

Nevada is divided into two Bird Monitoring Regions, Nevada's portion of the Great Basin (BMR 93), and Nevada's portion of the Mojave Desert (BMR 94). A total of 25 sites have been identified as important congregation sites for aquatic species, 19 in the Great Basin and 7 in the Mojave Desert. In Nevada, the Great Basin region has 73, and the Mojave region has 60 focal aquatic species (Tables 1 and 2). As a general rule, the majority of waterfowl, waterbirds, and shorebirds are observed during the migration and winter seasons in Nevada, but Nevada also supports significant breeding populations of some species, for example Black-necked Stilts, American Avocets, White-faced Ibis, American White Pelican, and several ducks. Secretive marshbirds of Nevada can best be surveyed during their mating and nesting seasons (February – June). The Great Basin region stands out for having major congregation sites of wintering waterfowl and of migrating waterbirds and shorebirds (Table 1), and the Mojave Desert region stands out for having critical sites for migrating shorebirds and secretive marshbirds (Table 2).

Most congregation sites of aquatic birds in Nevada fall into one of three categories: (1) playa lakes and marshes; (2) actively managed wetland cells and agricultural areas; and (3) reservoirs and other deep impoundments. Some sites are also associated with desert springs, but most natural springs are too small to provide a congregation site.

Nevada's congregation sites have several characteristics in common that may affect strategies for surveying bird populations. Many Great Basin playa wetlands are shallow, and may be dry in some years but provide high-use (Type I) habitat in wet years. These ephemeral wetlands usually have great bird visibility due to lack of emergent vegetation. When inundated, they often need to be surveyed from access roads or air, because they are too shallow for motorized boats and too treacherous to be approached from the ground. Ephemeral wetlands are rarely used by secretive marshbirds but they can provide major migration stopover sites for shorebirds, waterbirds, and waterfowl.

Permanent wetlands that are associated with springs, refuges, or waterfowl management areas typically have significant emergent vegetation, which provides habitat for secretive marshbirds, but also reduces detection rates of all birds associated with these microhabitats. These sites often have good access roads and decent visibility from dikes. Some may require either motorized boats or canoes for a comprehensive count. Managed wetlands depend on water rights, so they often function similar to ephemeral wetlands or reservoirs in terms of habitat availability.

Reservoirs and other impoundments undergo significant stage fluctuations and therefore offer varying amounts and types of habitats. Stage draw-down may expose shallow areas that attract shorebirds, but may also reduce habitat availability in the deltas for a diversity of aquatic species that use it when inundated. Reservoirs often have little emergent vegetation and may therefore provide sparse habitat for secretive marshbirds and other species associated with marshes.

Important components of statewide monitoring of aquatic birds will likely include being able to estimate water availability each year in the spring and conduct reconnaissance flights or ground visits to determine habitat condition prior to surveying. For instance, the Nevada Department of Wildlife (NDOW) has been conducting mid-winter waterfowl surveys using fixed-wing aircraft for many years. Additional planning with NDOW's surveyor may refine our current understanding about where high-use areas are during low-water and high-water years. Further, it may be possible to work out a simple reconnaissance aspect to these flights, for instance a permanently installed camera that can be triggered when approaching a site. Flights will likely play an important role in monitoring aquatic birds in Nevada, because the state is large, and many aquatic sites are in remote areas. Aerial surveys also have the advantage of removing selection bias that occurs when ground access is impossible.

Five of the 34 Nevada sites have already been identified as too complex for complete counts of most taxa using ground-based methods, including Lahontan Valley, Quinn and Little Humboldt Rivers, NW Nevada lakes and playas, Upper Humboldt River, and Lower Humboldt River. For these, a sampling plan needs to be developed that can be used to estimate bird numbers based on subsamples of the site. As monitoring is implemented statewide, it may also turn out that other sites, for which complete counts are achievable, could also be monitored sufficiently with a smaller subsampling effort.

To encourage the public to get involved in initial inventories and, later, in monitoring of aquatic birds, each of the well-defined sites described in this document is subdivided into sections that can be easily surveyed by a hobby bird-watcher. The Great Basin Bird Observatory is currently working on a simple data gathering protocol similar to that of the Christmas Bird Count program, which can be conveniently implemented by the birding public.

Many sites described in this document need to be studied in more detail if monitoring efforts are to be intensified. For this, we suggest reviewing existing survey data if

available, continued sharing of knowledge by biologists familiar with the site, or conducting pilot studies. These preparations may be necessary to better define and delineate habitats for focal species, to evaluate the effect of water availability on habitat distribution, and to fine-tune survey methods toward each site's specific circumstances.

In the Nevada site descriptions, the following acronyms will be used to identify governmental resource managers: BLM – Bureau of Land Management; USFS – U.S. Forest Service; USFWS – U.S. Fish and Wildlife Service; NWR – National Wildlife Refuge (USFWS); NDOW – Nevada Department of Wildlife; WMA – Wildlife Management Area (NDOW); NPS – National Park Service; BOR – U.S. Bureau of Reclamation; DoD – Department of Defense; DoE – Department of Energy.

Table 1. Focal species of the Great Basin region of Nevada (BMR 93). Listed are the common names and primary seasons (B – breeding; M – migration; W – wintering) in which the species occurs in this region.

Common Name	Seasons
Common Loon	MW
Horned Grebe	MW
Eared Grebe	BMW
Pied-billed Grebe	BMW
Clark's Grebe	BMW
Western Grebe	BMW
American White Pelican	B
Double-crested Cormorant	B
American Bittern	B
Black-crowned Night-Heron	B
Snowy Egret	B
Great Egret	B
Great Blue Heron	BMW
White-faced Ibis	B
Tundra Swan	MW
Greater White-fronted Goose	MW
Snow Goose	MW
Ross's Goose	MW
Canada Goose	BMW
Wood Duck	B
Mallard	BMW
Gadwall	BMW
Green-winged Teal	BMW
American Wigeon	MW
Northern Pintail	BMW
Northern Shoveler	BMW
Blue-winged Teal	BMW
Cinnamon Teal	BMW
Canvasback	BMW
Redhead	BMW
Ring-necked Duck	BMW
Greater Scaup	W
Lesser Scaup	W
Common Goldeneye	W
Barrow's Goldeneye	B
Bufflehead	W
Common Merganser	MW
Ruddy Duck	BMW
Virginia Rail	B
Sora	B
Common Moorhen	BMW
American Coot	BMW
Sandhill Crane	B
Snowy Plover	B
Semipalmated Plover	M
Killdeer	BMW
American Avocet	B
Black-necked Stilt	B
Willet	B
Greater Yellowlegs	M
Lesser Yellowlegs	M
Spotted Sandpiper	B
Long-billed Curlew	B
Marbled Godwit	M
Dunlin	M
Western Sandpiper	M
Least Sandpiper	M
Long-billed Dowitcher	M
Common Snipe	BMW
Wilson's Phalarope	BM
Red-necked Phalarope	M
Franklin's Gull	BM
Bonaparte's Gull	M
Ring-billed Gull	BMW
California Gull	BMW
Herring Gull	W
Caspian Tern	B
Forster's Tern	B
Common Tern	M
Black Tern	B
Marsh Wren	BMW
Yellow-headed Blackbird	BM
Red-winged Blackbird	BMW
Tricolored Blackbird	B

Table 2. Focal species of the Mojave Desert region of Nevada (BMR 94). Listed are the common names and primary seasons (B – breeding; M – migration; W – wintering) in which the species occurs in this region.

Common Name	Seasons
Eared Grebe	BMW
Pied-billed Grebe	BMW
Clark's Grebe	BMW
Western Grebe	BMW
American White Pelican	B
Double-crested Cormorant	B
Least Bittern	B
Black-crowned Night-Heron	B
Green Heron	B
Cattle Egret	B
Great Blue Heron	BMW
White-faced Ibis	B
Tundra Swan	MW
Trumpeter Swan	MW
Greater White-fronted Goose	M
Snow Goose	MW
Ross's Goose	MW
Canada Goose	BMW
Mallard	BMW
Gadwall	BMW
Green-winged Teal	BMW
American Wigeon	MW
Northern Pintail	BMW
Northern Shoveler	BMW
Cinnamon Teal	BMW
Canvasback	BMW
Redhead	BMW
Ring-necked Duck	BMW
Greater Scaup	W
Lesser Scaup	W
Common Goldeneye	W
Bufflehead	W
Common Merganser	MW
Red-breasted Merganser	W
Ruddy Duck	BMW
Clapper Rail	B
Virginia Rail	B
Sora	B
American Coot	BMW
Semipalmated Plover	M
Killdeer	BMW
American Avocet	B
Black-necked Stilt	B
Willet	BM
Greater Yellowlegs	M
Lesser Yellowlegs	M
Spotted Sandpiper	B
Marbled Godwit	M
Western Sandpiper	M
Least Sandpiper	M
Long-billed Dowitcher	M
Common Snipe	BMW
Wilson's Phalarope	BM
Red-necked Phalarope	M
Ring-billed Gull	BMW
California Gull	BMW
Forster's Tern	B
Marsh Wren	BMW
Yellow-headed Blackbird	BM
Red-winged Blackbird	BMW

IV. Summary of Site Occupancy by Aquatic Bird Species and Proposed Survey Methods for Nevada

The following summary tables provide an overview of the species groups that are present in significant numbers on a regular basis in Nevada's designated aquatic sites (Table 3), and the survey methods that should be implemented to monitor these groups (Table 4).

Surveys for aquatic birds can be categorized by basic method: aerial surveys (fixed-wing aircraft or helicopter), and ground-based surveys (by road, on foot, on boat).

Aerial surveys are best suited for counts that involve large numbers of birds that can be identified from the air. They are therefore particularly useful for wintering and migrating waterfowl (for which they have been applied annually), other large waterbirds such as cormorants and pelicans, and large shorebirds. Flights can also serve as an important reconnaissance tool to determine high-use habitats of other species groups. We therefore suggest that flights undertaken by Norm Saake (formerly of NDOW) for waterfowl counts are continued and, if possible, expanded to include (1) reconnaissance of water availability and bird use areas in the designated sites and elsewhere, and (2) to explore options of conducting aerial counts of additional aquatic species.

Most other surveys involve boat counts (larger sites), shore counts (smaller sites), and specialized surveys, particularly for secretive marshbirds. Marshbird surveys are currently largely restricted to Yuma Clapper Rail surveys conducted by several agencies in southern Nevada. There are currently no plans of expanding these to include other secretive marshbirds, at least until a national survey protocol and sampling plan becomes available (scheduled to be released within the next years). Similarly, colony counts and wintering landbird (specifically Bald Eagle) surveys are specialized surveys that cannot be easily combined with other, multi-species surveys. Some such efforts are already ongoing, and plans to expand these will be considered in later drafts of this document.

Shorebirds and waterbirds (other than waterfowl) occur in their highest numbers during spring and fall migration (early April – mid-May, and mid-August through late September). For this group, we suggest to implement complete area surveys, where possible, at least three times during each migration period. The three surveys should be evenly spaced with a random start date, and although "peak" counts are important for inventories, the long-term monitoring effort should not specifically attempt to capture (or avoid) peak-days during any single survey. Shorebirds and small waterbirds are difficult to identify to species at a distance, and should thus be primarily surveyed from the shoreline or by boat.

To facilitate inventory and begin more comprehensive monitoring of shorebirds and waterbirds, the Great Basin Bird Observatory (GBBO) is offering a simple sampling protocol (Table 5) and a publicly accessible online data base that can be used to store data from boat and shoreline surveys. The objective in such surveys is to get complete counts of a wetland, or a section of a wetland, for any given visit. This allows volunteers, agency

personnel, and other interested parties to contribute easily to a large data base, store and retrieve information for sites and species of their interest. The data base will be available on www.gbbo.org.

Table 5: Data sheet for multi-species, year-round, shorebird and waterbird counts in Nevada.

Enter form data online at www.gbbo.org or mail form to GBBO @ 1755 E. Plumb Ln. Suite 256, Reno, NV 89511

Date:_____ Observer(s):_____

_____

Site:_____ Section:_____

Start Time: _____ End Time: _____

	Tally	Total		Tally	Total
Common Loon			Ruddy Duck		
Pacific Loon			Unknown Duck		
Yellow-billed Loon			Common Merganser		
Unknown Loon			Red-br. Merganser		
Horned Grebe			Unknown Merganser		
Eared Grebe			Clapper Rail		
Pied-billed Grebe			Virginia Rail		
Unknown Small Grebe			Sora		
Clark's Grebe			Common Moorhen		
Western Grebe			American Coot		
Western/Clark's Grebe			Snowy Plover		
Am. White Pelican			Semipalmated Plover		
Double-cr. Cormorant			Unknown Plover		
Least Bittern			Killdeer		
American Bittern			American Avocet		
Black-cr. Night-Heron			Black-necked Stilt		
Green Heron			Willet		
Cattle Egret			Greater Yellowlegs		
Snowy Egret			Lesser Yellowlegs		
Great Egret			Spotted Sandpiper		
Great Blue Heron			Long-billed Curlew		
White-faced Ibis			Marbled Godwit		
Tundra Swan			Dunlin		
Trumpeter Swan			Western Sandpiper		
Snow Goose			Least Sandpiper		
Ross's Goose			Unknown Sandpiper		
Canada Goose			Long-billed Dowitcher		
Wood Duck			Wilson's (Common) Snipe		
Mallard			Wilson's Phalarope		
Gadwall			Red-n. Phalarope		
Green-winged Teal			Unknown Phalarope		
American Wigeon			Franklin's Gull		
Northern Pintail			Bonaparte's Gull		
Northern Shoveler			Ring-billed Gull		
Blue-winged Teal			California Gull		
Cinnamon Teal			Herring Gull		
Unknown Teal			Unknown Gull		
Canvasback			Caspian Tern		
Redhead			Forster's Tern		
Ring-necked Duck			Common Tern		
Greater Scaup			Black Tern		
Lesser Scaup			Unknown Tern		
Unknown Scaup					
Common Goldeneye					
Barrow's Goldeneye					
Unknown Goldeneye					
Bufflehead					

Additional comments: (e.g., extreme survey conditions involving very high winds or very high precip)

Table 3: Occurrence of significant numbers of aquatic birds in designated sites of Nevada.

Site	Loons, Grebes	Colonies	Waders and Cranes	Secretive Marshbirds	Waterfowl, Breeding	Waterfowl, Migrating/Wintering	Shorebirds, Breeding	Shorebirds, Migrating	Gulls and Terns	Landbirds, Breeding	Landbirds, wintering (e.g., BAEA)	Comment
Great Basin												
Ruby Valley Complex	x	x	x	x	x	x	x	x	x	x		eared grebes, bobolinks, black terns, least bittern
Walker Lake	x					x						
Pyramid Lake/Anaho	x	x			x	x		x	x			largest Canada Goose mating site, and mergansers
Lahontan Valley	x	x	x	x	x	x	x	x	x	x		largest shorebird mig./nesting site in NV; ibis, terns, egrets
Mason Valley WMA		x	x	x	x	x		x		x		osprey, grebes breeding
Lahontan Reservoir	x	x	x		x	x			x	x	x	grebes, bald eagles nesting, gull colony
Washoe Lake		x	x	x	x	x	x		x			willets nesting, night-herons
Quinn and Little Humboldt River	x	x	x	x	x	x	x	x	x	x		cranes, bobolink, grebes, ibis nesting
Steptoe WMA					x	x	x					curlews
Snow Water and Goshute Lakes						x		x				
South Fork Reservoir	x					x					x	
Wildhorse Reservoir	x				x	x					x	nesting Canada Geese, mergansers, cranes
Duck Valley Wetlands		x	x	x	x	x	x	x	x		x	black tern, forsters, curlews
Upper Humboldt River		x	x	x	x	x	x	x	x		x	willets
Lower Humboldt River		x	x	x	x	x	x	x			x	curlews, willets
Rye Patch Reservoir	x	x	x			x					x	nesting colonies sometimes
Artesia Lake					x	x	x	x	x			maybe delete site?
Kirch WMA		x	x	x	x	x	x	x				curlews,cranes, grebes
NW Nevada Lakes and Playas	x	x	x	x	x	x	x	x	x	x	x	western grebes, eared grebes, black terns
RR Valley				x	x	x	x	x				
Little Fish Lake	x				x	x		x				grebes,

Site	Loons, Grebes	Colonies	Waders and Cranes	Secretive Marshbirds	Waterfowl, Breeding	Waterfowl, Migrating/Wintering	Shorebirds, Breeding	Shorebirds, Migrating	Gulls and Terns	Landbirds, Breeding	Landbirds, wintering (e.g., BAEA)	Comment
Big Smoky Valley						x		x				
Topaz Lake	x					x			x	x	x	bald eagle nesting
Carson Valley		x	x	x	x	x					x	cranes, shorebirds, ibis
Humboldt Sink	x	x	x	x	x	x	x	x	x		x	ibis, caspian terns
Continental Lake					x	x		x				
Mojave Desert												
Overton WMA, lower Muddy River	x		x	x		x		x		x	x	
Ash Meadows NWR	x		x	x		x						
Las Vegas Wash, Henderson Plant	x			x	x	x			x	x		
Lake Mead	x	x				x		x	x		x	
Lake Mohave	x					x			x		x	
Pahranagat NWR	x		x	x	x	x		x	x		x	
Key Pittman WMA	x		x	x	x	x		x	x		x	
Virgin River	x			x		x		x		x		
Lower Colorado	x			x		x		x	x			

Table 4: Primary survey methods for monitoring focal species of Nevada.

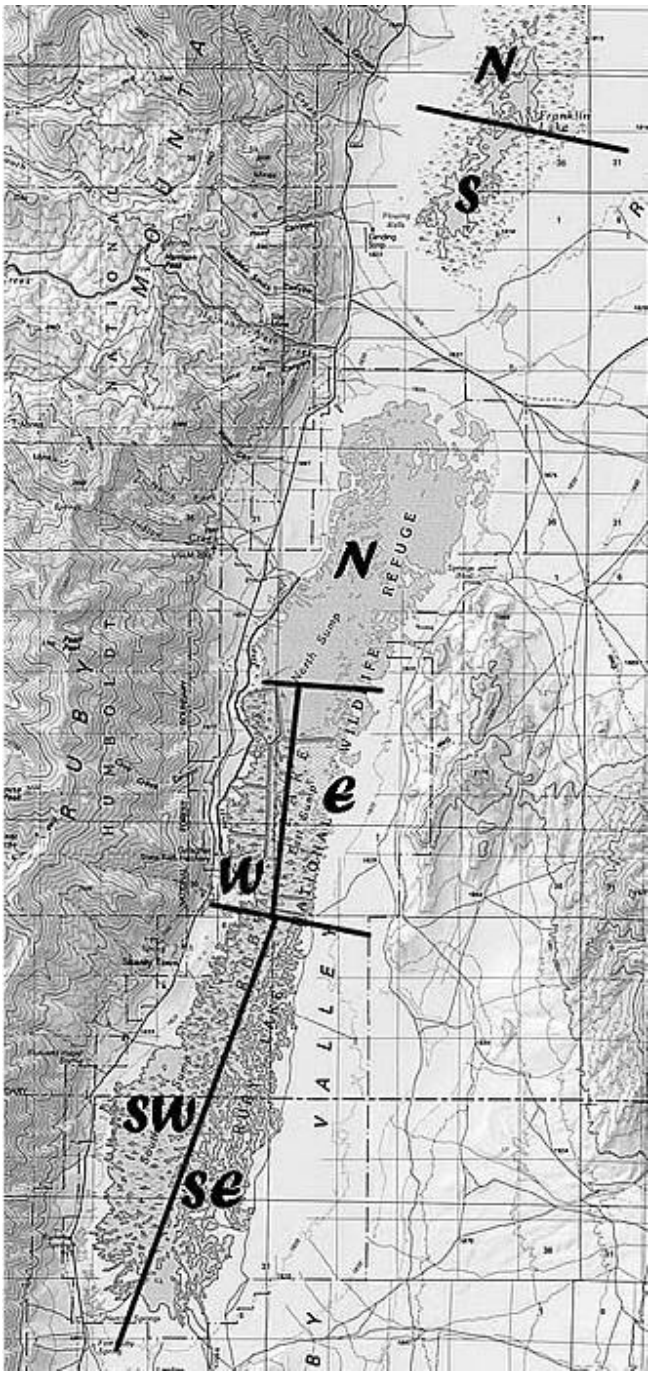
Site	Aerial surveys, multi-species, migration/winter	Aerial surveys, multi-species, breeding season	Colony counts (aerial or ground)	Wintering landbirds (aerial or ground, e.g., BAEA)	Ground-based surveys, multi-species	Ground-based surveys, migrating shorebirds	Ground-based surveys, breeding shorebirds	Ground-based surveys, secretive marshbirds
Great Basin								
Ruby Valley Complex	x	x	x		x	x	x	x
Walker Lake	x				x			
Pyramid Lake/Anaho Island	x		x		x	x		
Lahontan Valley	x	x	x	x	x	x	x	x
Mason Valley WMA	x	x	x		x	x		x
Lahontan Reservoir	x	x	x		x			
Washoe Lake	x	x	x		x		x	x
Quinn and Little Humboldt River	x	x	x		x		x	x
Steptoe WMA	x	x	x		x		x	
Snow Water and Goshute Lakes	x				x	x		
South Fork Reservoir	x			x	x			
Wildhorse Reservoir	x			x	x			
Duck Valley Wetlands	x	x	x	x	x	x	x	x
Upper Humboldt River	x	x	x	x	x		x	x
Lower Humboldt River	x	x	x	x	x		x	x
Rye Patch Reservoir	x		x	x	x			
Artesia Lake	x	x			x	x	x	
Kirch WMA	x	x	x		x		x	x
NW Nevada Lakes and Playas	x	x	x	x	x	x	x	x
RR Valley	x	x			x	x	x	x
Little Fish Lake	x	x			x	x		
Big Smoky Valley	x				x	x		
Topaz Lake	x			x	x			x
Carson Valley	x	x		x	x			x
Humboldt Sink	x	x	x	x	x		x	x
Mojave Desert								
Overton WMA	x				x	x		x
Ash Meadows NWR					x			x
Las Vegas Wash, Henderson Plant	x				x			x
Lake Mead	x		x	x	x	x		
Lake Mohave	x			x	x			
Pahranagat NWR	x	x		x	x	x		x

Site	Aerial surveys, multi-species, migration/winter	Aerial surveys, multi-species, breeding season	Colony counts (aerial or ground)	Wintering landbirds (aerial or ground, e.g., BAEA)	Ground-based surveys, multi-species	Ground-based surveys, migrating shorebirds	Ground-based surveys, breeding shorebirds	Ground-based surveys, secretive marshbirds
Key Pittman WMA	x	x			x	x		x
Virgin River					x	x		x
Lower Colorado River	x				x	x		x

V. Descriptions for BMR 93: Nevada - Great Basin

Stratum 1: Designated sites

1. Ruby Valley Complex



Boundaries
Ruby Lake: (Refuge Boundary - roughly) West boundary: T25N R57E S3,11,14 and T26N R57E S1,11,14,15, and T27N R57E S1,12,13,24,25,36 and T28N R58E S20,30,31; North boundary: T28N R58E S21,22,23; East boundary: T28N R58E S26,35 and T27N R58E S210,13,15,22,27,33 and T26N R58E S4,9,16,21,28,33 and T25N R58E S6 and T25N R57E S12,13; South boundary: T25N R57E S13,14

Franklin Lake: (Roughly) West boundary: T28N R58E S3,10 and T29N R58E S15,22,28,33; North boundary: T29N R58E S11,12; East boundary: T29N R58E S13,24,25,35 and T28N R58E S2,11; South boundary T28N R58E S10,11

Ownership
Ruby Lake: Public land administered by the USFWS.
Franklin Lake: Northern half (roughly) private, southern half (roughly) public. Public land administered by NDOW.

Focal Species
All focal species listed for BMR 93 except:

common loon, tundra swan, snow goose, wood duck, common moorhen, black-bellied plover, snowy plover, dunlin, west and least sandpipers, Bonaparte's gull

Type I Habitat
Permanent emergent marsh
Seasonal wetlands (playas)
Meadows adjacent to the permanent and seasonal wetland

Type II Habitat
Meadows and grasslands adjacent to Type I habitat

Access and Bird Visibility
Limited ground access to interior areas of emergent marsh due to logistics; entry of wetlands difficult and dangerous due to unconsolidated soils and shallow water. Margins of emergent marsh and seasonal wetland areas and meadows accessible. Limited ground visibility of birds in emergent marshes. Birds in seasonal wetlands visible from shorelines. Permits need to be obtained from NDOW, Ruby Lake NWR, and from private landowners (Franklin Lake).

Past and Current Surveys
Ruby Lake: numerous annual aerial and ground surveys by refuge personnel and NDOW since 1978
Franklin Lake: periodic aerial and ground surveys since 1978

Potential Survey Methods

description

All three survey methods (aerial, ground, boat) feasible. To survey northern section of the Ruby Lake, boats may be necessary because ground access is poor. Complexity of the site may make it a candidate for subsampling.

selection bias

None, if access problems can be overcome (e.g., through aerial surveys or canoe). Permission from landowners and agencies needs to be obtained for ground surveys in all areas.

measurement error and bias

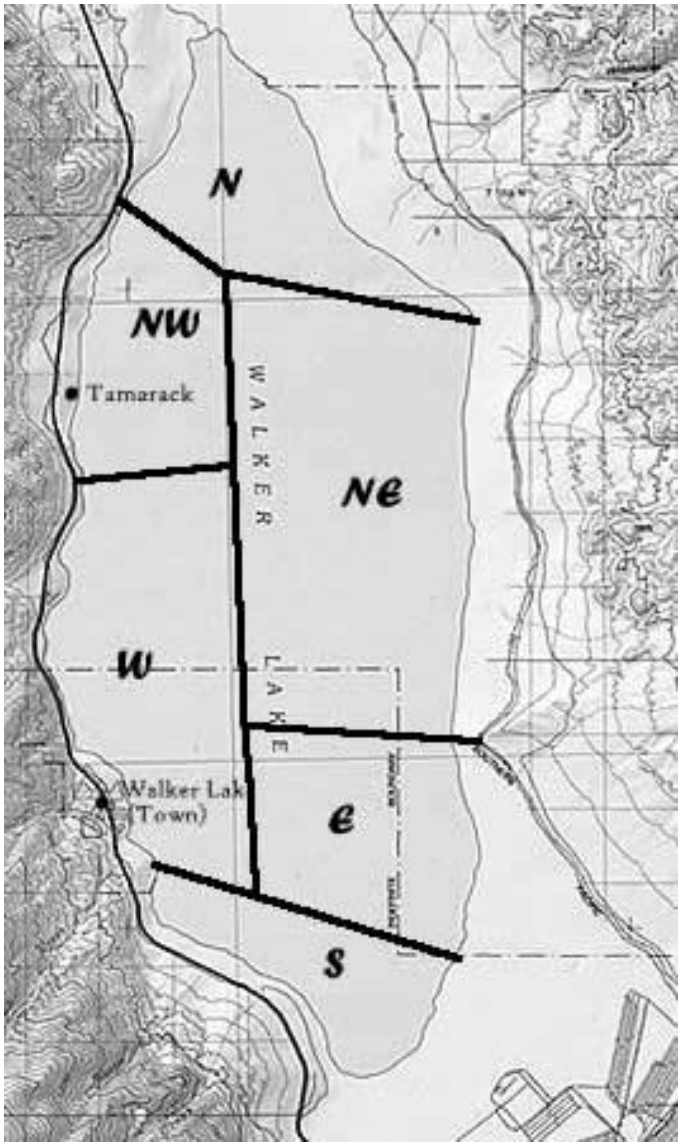
Observer's skill level variability
Bird visibility in emergent vegetation
Bird detection variability

Pilot Studies Needed

None.

Contact with Local Knowledge: Jeff McKay (Ruby Lake NWR)

2. Walker Lake



Boundaries and Ownership
Boundaries well-defined by lake shores. The lake and immediately adjacent areas are primarily owned by BLM, the south shore is regulated by the Hawthorne Army Depot. In close proximity to the shoreline are a small amount of private lands, DoD lands associated with the Army Depot, and Walker River Paiute Tribal lands.

Focal Species
Focal species at this site include open-water piscivorus birds, Common Loon, Western and Clark's Grebe, Pied-billed Grebe, American Coot, Snowy Plover, White-faced Ibis, and American White Pelican.

Location of Type I and II Habitat
All open water in the site is Type I habitat for focal species.

Access and Visibility
Walker Lake is 2 ½ to 3 hours from Reno and Carson City, with smaller towns in between. The site itself is not particularly remote, with camping and other accommodations available nearby in Hawthorne. A highway with pull-outs bounds the west side of the lake. South and east side can be accessed via dirt roads (4x4 needed). Waterbirds can be counted by spotting scope, but the lake is too large for complete counts from the shore. Boat ramps along the western shore provide public access. Mud flats and Snowy Plover nesting sites are primarily on DoD lands on the southeastern shore. No public access to DoD lands without permission and pre-arranged escorts by Army Depot personnel. Army Depot personnel may be open to helping with surveys.

Past and Current Surveys
NDOW has conducted surveys for waterbirds and ibis in spring and fall since 1989 by boat. Waterfowl has been surveyed by NDOW for about three decades during winter flights (fixed wing aircraft). Audubon Christmas Bird Counts have been conducted in roughly the southern half of the lake since 1997, mostly from shoreline. Ad hoc surveys by amateur birders have been going on for ca. 20 years, many of these sightings are archived at http://list.audubon.org/wa.exe?S1=nvbirds.

Potential Survey Methods

description- surveys from shore, boat, and aerial surveys (though air space restrictions may apply over Hawthorne Army Depot).

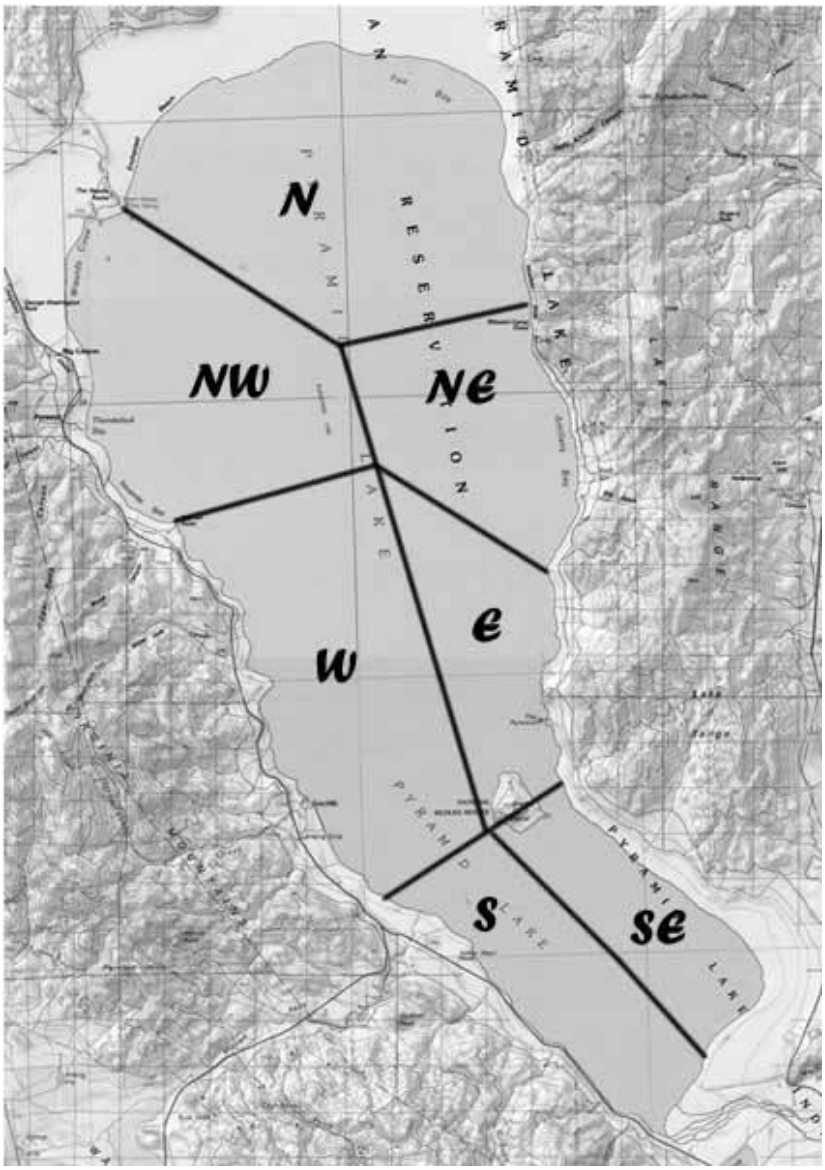
selection bias–no public access to limited shorebird habitat, but permission can be obtained from various land managers, given sufficient lead time.

measurement error & bias– Large, open waterbody with very limited emergent vegetation and good overall visibility of birds; some species (e.g., Common Loons) may be difficult to accurately count in aerial surveys due to diving; wind can significantly affect detectability due to wave action; detectability falls off with distance from the west shore (assuming shore-based survey); large lake that birds may also move during a count .

Needed Pilot Studies
Probably none as survey efforts have been ongoing at varying intensities for more than a decade.

Contact with Local Knowledge: Don McIvor, Lahontan Audubon Society.

3. Pyramid Lake



Boundaries Lake shorelines within T23 N – T 27 N and R 20 E – R 23 E.

Ownership
Pyramid Lake Paiute Tribe; USFWS has jurisdiction over Anaho Island as part of Stillwater NWR.

Focal Species
All species listed for BMR 93, at least if loose criteria are applied. Significant breeding site for American White Pelican and Double-crested Cormorant. Significant migration stop-over site for waterfowl, waterbirds, and many shorebirds. Significant wintering site for waterfowl and for waterbirds (especially grebes).

Type I Habitat
All open water for waterbirds and waterfowl, except the most central core of the lake (deepest water). Primarily the delta area and south and southeast shoreline for shorebirds.

Type II Habitat
The deepest part of the lake (central area) is sparsely used by focal species. The area should be sampled occasionally, though, to confirm this pattern.

Access and Visibility
From Reno, it takes about a 45-minute drive to get to Pyramid Lake. All ground surveys require day permit, and all boat surveys a boating permit, from Tribe. Access by boat is possible to all parts of the lake, given permission from the Tribe. Access on ground very good on W-shore, E-shore, and delta (S-shore), but sketchy on N and NE-shore (no general public access; special Tribal permit needed). Visibility is excellent. Not much, if any, emergent vegetation present. For big birds, Pyramid Lake lends itself to aerial surveys. Shorebirds can probably be comprehensively assessed in ground surveys.

Past and Current Surveys
Stillwater NWR conducts annual counts of the American White Pelican colony on Anaho Island and estimates its annual productivity. A subset of juveniles is also banded annually by refuge personnel. Christmas Bird Counts conducted since the mid-1990's cover roughly the southern half of the lake. Great Basin Bird Observatory has conducted annual fall migration counts for waterbirds and waterfowl, by boat and from shoreline, since 1998.

Potential Survey Methods

description Aerial, boat, and shoreline counts are all very feasible (given permission from Tribe). Colony counts on waterbirds of Anaho Island already in progress but may be expanded to other species (cormorants, gulls). Potential survey methods include area searches that cover part or all of the lake or transect samples by boat (ideally though in cross-sections across the entire lake, since birds often occur in "strata". The whole lake can be area-surveyed in one day by a crew of 8-10 on three boats and a shore crew.

selection bias All of the lake is easily visible by air and boat. Most shorelines, but not all, are easily accessible by land (4x4 advised). However, ground surveys by themselves can cover only a minor portion of the available Type I habitat of this big lake, i.e., what's visible from the shore.

measurement error and bias
Error: Possible problems stem from flushing birds by boat, aircraft, or on foot. Boat surveys and careful ground surveys are best for minimizing this problem. There is little or no cover for observers other than distance, so spotting scopes are definitely needed for ground surveys. High winds are common on this lake, affecting both the ability to launch boats and detectability of birds due to wave action. This site lends itself to testing error of different survey methods.

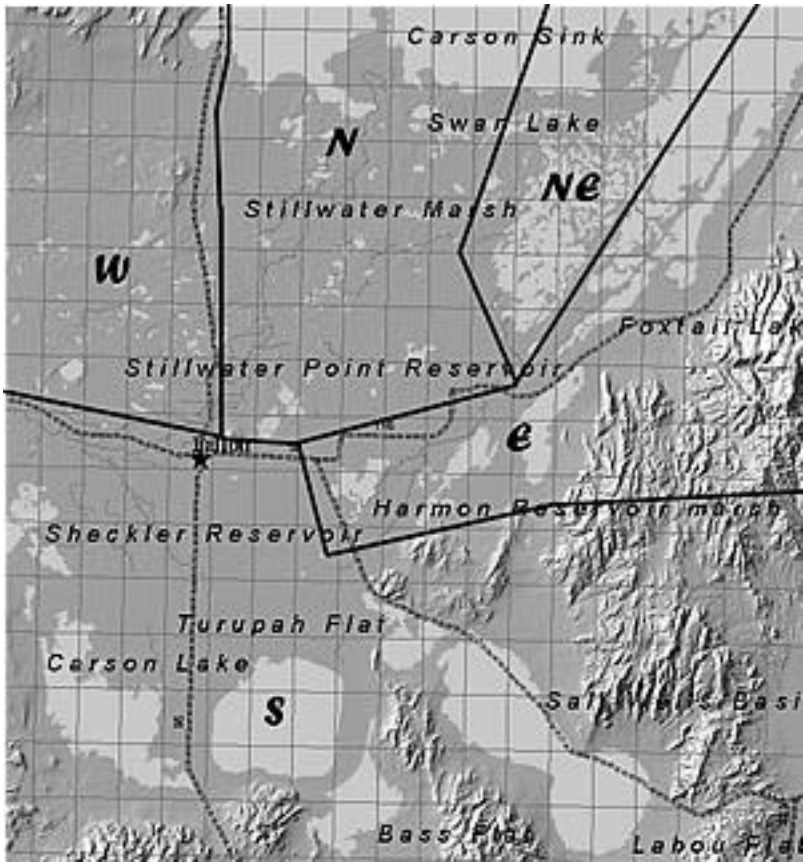
Bias: High abundances and species richness during migration and winter can lead to possible biases from observer skills. Another potential bias is directional change in water supply affecting shorebird habitat and lake salinity. The Truckee River is highly regulated (dams, reservoirs, diversions) and continued water withdrawal will expose shallows and shorelines and increase salinity, thereby affecting the prey base for several species. However, if regulation changes to allow more water into Pyramid Lake, then shorelines may be flooded and prey communities otherwise altered.

Pilot Studies Needed

Enough data may already available to assess the best survey methods. A comparative study of aerial, boat, and shoreline surveys to investigate may be particularly useful at this site. It would be useful to include a measure of potential habitat related biases, such as flow withdrawal or increase that result in changes to shorebird habitat availability.

Contacts with Local Knowledge: Dennis Serdehely, Local Birder; Donna Withers, Stillwater NWR.

4. Lahontan Valley



Boundaries and Ownership

Lahontan Valley is generally considered to include all terminal marshes, wetlands and impoundments associated with the lower Carson River below Lahontan Reservoir. Lahontan Valley wetlands extend from approximately T21N, R30-32E south-southeast through T17N, R28 -31E, including the wetland complexes of Stillwater NWR, wetlands around the town of Fallon, and Carson Lake WMA and surrounding wetlands. Most wetlands through Lahontan Valley are dispersed and many are ephemeral. For the purpose of this document, we categorize the area into five sections: (1) **NE:** Stillwater Marsh, (2) **E**: Refuge impoundments (Stillwater Point Reservoir and surrounding areas), (3) **S**: Carson Lake WMA and sourrounding sites, (4) **W**: Soda Lake and surrounding area, and (5) **N**: wetlands and springs of the lower Carson River. Within these sections, specific "designated" sites may be surveyed in isolation, for instance Soda Lake or Carson Lake, both popular birding destinations. Sheckler Reservoir, Harmon Reservoir, and Mahala and Massie Sloughs may also need to be included as specific sites, but the author knows too little about them to judge their importance to birds.

Stillwater NWR is under USFWS administration, and Carson Lake WMA is managed by NDOW. BLM lands surrounding Stillwater NWR also have dispersed wetlands and

Fallon Indian Reservation has a significant wetland complex. Soda Lake is in public ownership (?). Most small, dispersed wetlands are on BLM land or within the NWR and WMA boundaries, but several are located on private lands.

Focal Species
Most species listed for BMR 93. Significant breeding site for several shorebirds, including Snowy Plover, American Avocet, Black-necked Stilt and White-faced Ibis. One of the most significant migration stop-over sites of the state for waterfowl, waterbirds, and shorebirds. Important wintering site for waterbirds, waterfowl, some shorebirds, and tundra landbirds.

Type I Habitat
Carson Lake WMA, Stillwater NWR, Fallon Indian Reservation, and some areas outside these have permanent or seasonal wetlands of great significance to birds. Water delivery to most of these wetlands is subject to substantial year-to-year change, so the distribution of Type I habitat may greatly vary among years and seasons. The exact delineation of Type I habitat needs to be determined, by season, in a pilot study, unless the NWR and WMA already have assessments of bird use on their lands and surrounding areas. At Soda Lake, all open water is Type I habitat, as is probably the case for many smaller wetlands outside the NWR and WMA boundaries.

Type II Habitat
The distribution of Type II habitat varies, along with that of Type I habitat, from year to year and among seasons, and is primarily a function of water availability. Its distribution may also need to be determined in a pilot study.

Access and Visibility
The site is about 1 1/2 hours from Reno or Carson City, and about 15-25 min from Fallon. Access to NWR and WMA wetlands is good. Agreements with land management agencies need to be developed prior to conducting new surveys, and new surveys should be integrated with ongoing surveys. A permit from the Tribe is needed to access Reservation wetlands. Only a portion of the Stillwater and Carson Lake wetlands can be surveyed on foot or from roads. Entry of wetlands on foot is extremely treacherous in some areas and never recommended. Visibility is a problem in many wetlands during the growing season due to emergent vegetation. Accurate counts in complex wetlands may only be possible by aircraft or boat.

Past and Current Surveys
NDOW and USFWS have done extensive surveys on shorebirds and wintering waterfowl on their lands from 1989-1999. Most of these were surveys of migrating and wintering populations. Also, a significant effort by these agencies has gone into monitoring White-faced Ibis. New survey efforts need to be closely coordinated with these two agencies. A Christmas Bird Count has also been conducted in this site for over 5 years (contact: Larry Neel of NDOW). As part of an annual birding festival in May, Spring Wings, the site also gets significant attention from birders, and species lists from at least four festivals are available (contact: Jim Lytle of Lahontan Audubon Society). This site generally draws a

lot of visits from birders throughout the year, but mostly during migration and winter. Their sightings, if reported on the Nevada bird listserv, are archived online.

Potential Survey Methods

description Aerial, boat, and shoreline counts are all feasible (given permission from agencies, Tribe, and landowners). This site needs to be further subdivided than what is indicated on the map above. It is also a site that needs to be subsampled, because complete counts will not be possible due to its complexity. Most work on the ground will be restricted to berms or natural uplands, but access on these is good due to maintenance roads (4x4 recommended). Some wetlands are very shallow, so boat surveys need to be planned with the help of land managers, and may involve the use of canoes. The site is characterized by complex wetlands, changing habitat distribution due to changing water availability, and difficult on-the-ground access to remote sections. Therefore, aerial surveys may continue to play a significant role in monitoring this site. A combination of complete counts in permanent, distinct wetlands and subsampling of surrounding wetlands, perhaps through a transect method, are a possible approach for ground-based and boat surveys. Lahontan Valley is among the most complex, large wetland sites in the state and it is among the most important sites for aquatic bird monitoring. Any type of survey, except aerial surveys, would involve a multi-day effort unless a very large survey crew is available. For comprehensive monitoring, it may therefore be useful to subdivide it into sections that are surveyed in logistically separate efforts.

selection bias Due to the site's complexity, selection bias could be a significant issue. Planning with the local agencies is necessary to determine which portions of the site are inaccessible using ground-based methods. Because much of the land is in public ownership, it should be possible to secure permission to access to most areas. Private and Tribal lands require formal permission, and if not given, this may also cause selection bias.

measurement error and bias

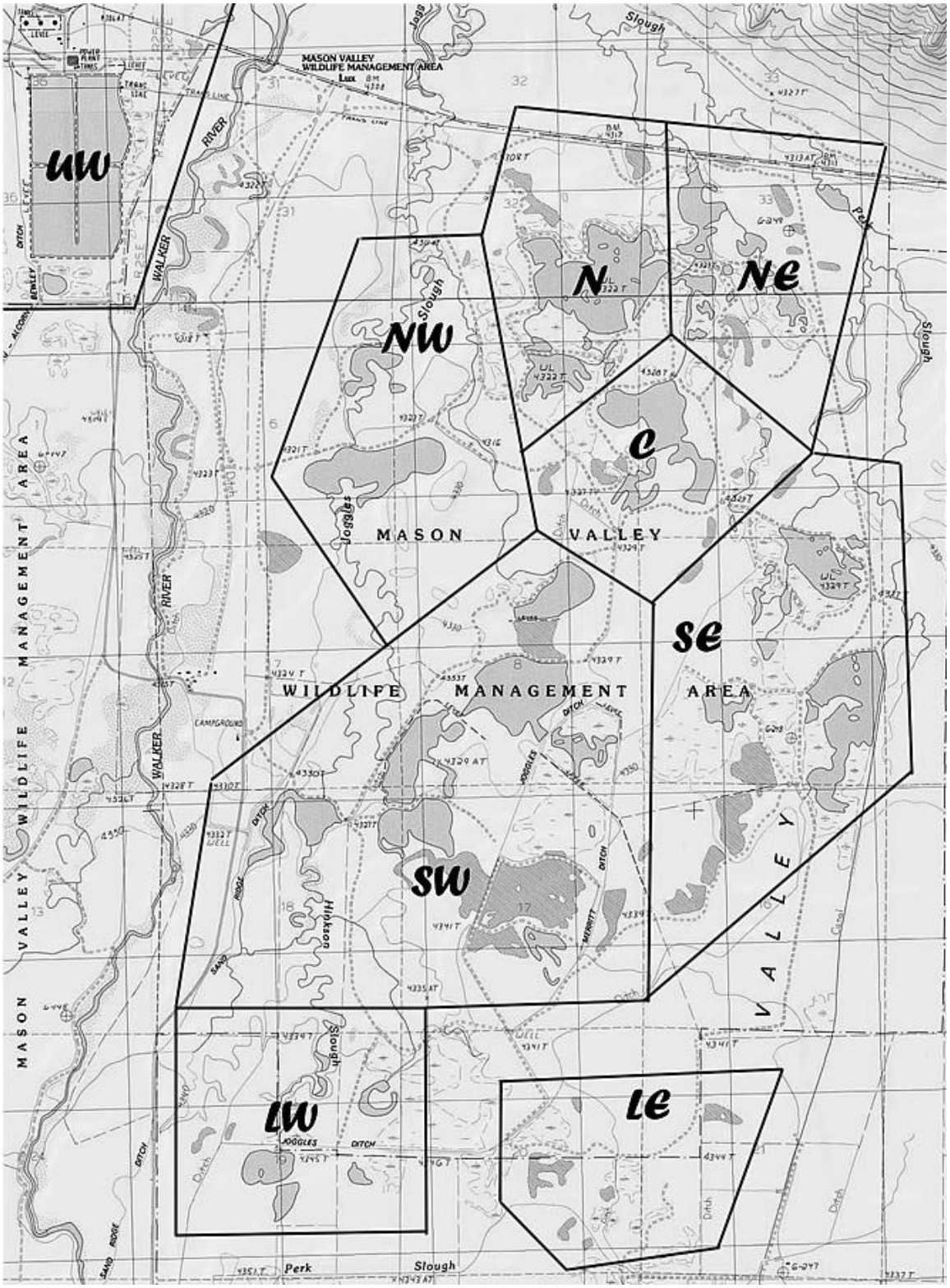
The distribution of available habitat may be a source of measurement error, unless surveys are carefully designed around this issue. Significant emergent vegetation in many areas introduces error by affecting detectability of some species in all seasons. Due to the site's complexity, aerial surveys may involve very low altitude flights that cause flushing of birds. The site is also characterized by very high abundances and species richness during migration, so observer skills may play a major role in both error and bias. Variable water availability may also cause a problem with error and/or bias, although the trend in water availability has not been directional in the recent past (i.e., no gradual long-term decline or increase in water delivery). One difficulty that needs to be addressed in the survey design is that water is actively managed in most of Lahontan Valley and that water delivery for a large portion of wetlands often depends on annual water availability. Therefore, high annual and seasonal variability may cause a site to be Type I habitat one year, or one season, but not necessarily all years or seasons.

Pilot Studies Needed

Depending on how much information is available from the local land management agencies, pilot studies may or may not be needed to develop a comprehensive monitoring plan for Lahontan Valley. Extensive monitoring has been done by Stillwater NWR and NDOW, and information from these efforts may be sufficient for expanding surveys. Whether or not additional pilot studies are needed should be determined in coordination with these agencies. Pilot studies may address the following issues: (1) distribution of Type I and Type II habitats, by season, throughout the valley; (2) survey cost and effort needed to do comprehensive monitoring; and (3) effect of water delivery on local bird abundances.

Contacts with Local Knowledge: Bill Henry (Stillwater NWR), Larry Neel (NDOW).

5. Mason Valley WMA



Boundaries
West: Range 25 from T.15N, R. 25E, S. 35 south to T.14N, R.25E, S. 25-26
South: T.14N, R.25E, S. 25-26 east to T.14N, R.26E, S. 27
East: T.14N, R.26E, S. 27 north to Southern Pacific Railroad (T.15N, R.26E, S. 34)
North: Southern Pacific Railroad from T.15N, R.26E, S. 34 west to T.15N, R.25E, S. 35

Ownership
NDOW
Sierra Pacific Power Co.
Private - T.14N, R26E, S. 30, 29, 29, 27, portions of 19, 20, 21, 22
Mason Valley WMA
Wabuska Power Plant Cooling Ponds

Focal Species
White-faced Ibis
Snowy Egret
Great Egret
Black Tern
Clark's Grebe
Great Blue Heron
Western Grebe
American Avocet
Black-necked Stilt
American Bittern
Least Bittern

Type I Habitat
All WMA wetland units
Wabuska Cooling Ponds

Type II Habitat
Agricultural fields when flooded

Access and Visibility
The site is about a 1 ½ hour drive from the Reno/Carson area. All Type I habitat is accessible. Most sites, if not all can be surveyed from shore with decent visibility. However, wetland units on WMA have emergent vegetation that might affect visibility in certain places.

Past and Current Surveys
All sites have been surveyed systematically in the winter via aerial waterfowl survey since 1966.
Spring Shorebird Surveys – opportunistic since 1988
Fall Shorebird Surveys – opportunistic since 1988
Aerial Colonial Nesting Bird Surveys – opportunistic 1990-1992

Potential Survey Methods

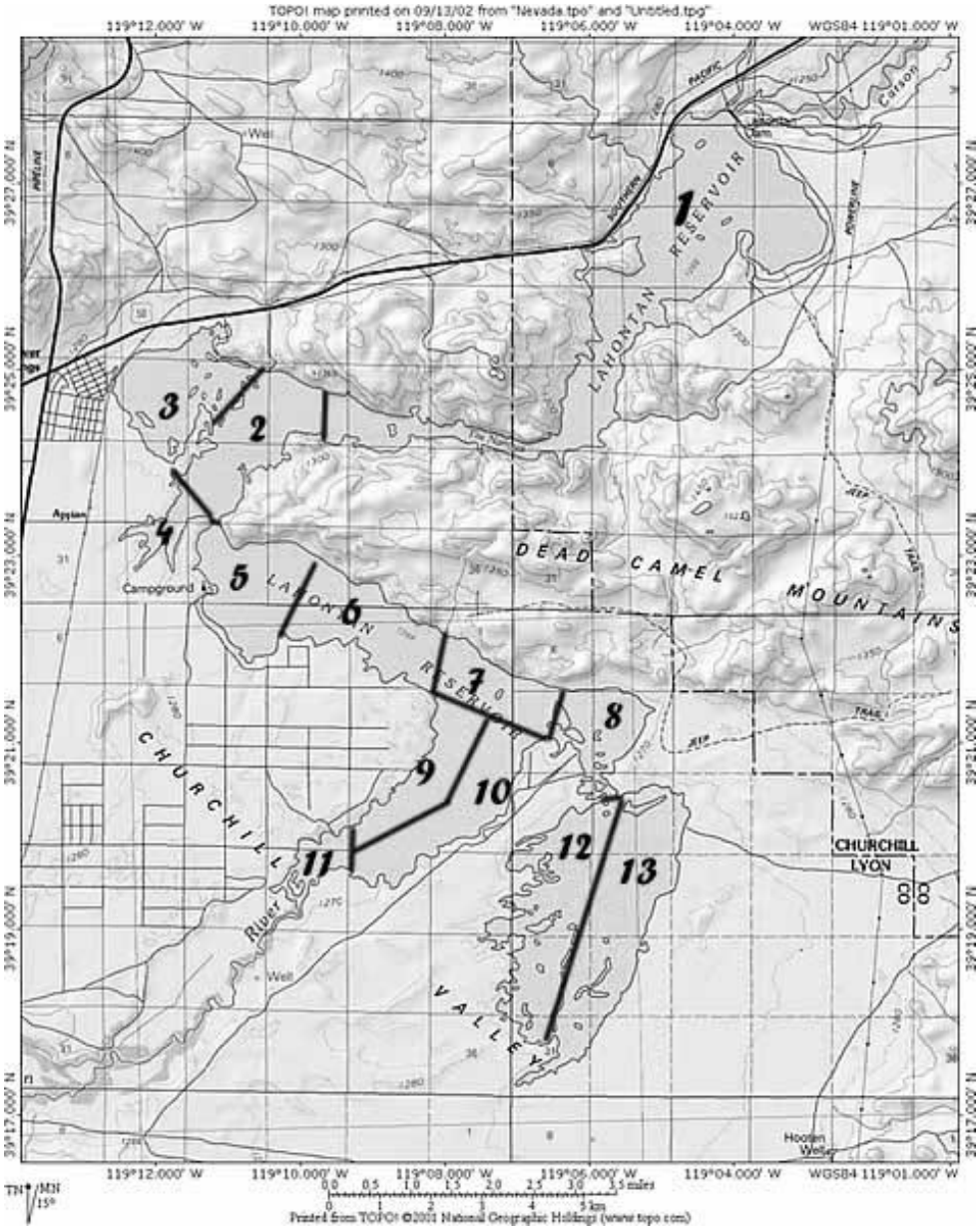
Description
Ground surveys are feasible throughout the site, although sometimes birds are hidden by emergent vegetation, or get easily flushed when ponds are approached on dike roads.

selection bias
None

measurement error and bias
Visibility obstructed by emergent vegetation
Observer variability

Pilot Studies Needed
Probably not. Preliminary historical efforts probably sufficient. Some thought should be given into the importance of and approach to survey of flooded agricultural fields.

6. Lahontan Reservoir



Boundaries and Ownership

Lahontan Reservoir covers approximately 26 square miles in northern Lyon and southwestern Churchill Counties. A 162 foot high dam on the Carson River created the reservoir as part of the Newlands Project in 1915. The reservoir is fed by the Carson River and a 32.5 mile diversion canal from the Truckee River. An island in the reservoir is the only Ring-billed Gull rookery in the state along with California Gull, Double-crested Cormorant, egrets and herons. Limited marshes surround the reservoir with the exception of the Carson River delta where there are extensive marshes. Capacity is 317,500 acre-feet; however this is drawn down to almost nothing for agricultural

purposes in dry years. Lahontan Reservoir is BOR and Water District property surrounded by BLM and, on the southwest shore, by private lands of Silver Springs. An agreement between BOR and the NV Division of Parks has created the Lahontan Reservoir Recreation Area on the east shore.

Focal Species

Ring-billed Gull, California Gull, Black-crowned Night-heron, Snowy Egret, and Double-crested Cormorant nest at rookery
Black Tern?
Common Merganser, Bufflehead, Common Goldeneye, Wood Duck, Canada Goose, and other waterfowl
Shorebirds?
Common Moorhen
Bank Swallow colonies
Bald Eagle nesting (only successful, known, active nest site in NV)

Location of Type I Habitat

All open water and some of the marshes at the delta are Type I habitat. Nesting colonies are also Type I habitat (where are they?).

Location of Type II Habitat

Little or no Type II habitat probably exists, unless some portions of the reservoir are identified as such in preliminary surveys.

Access and Visibility of Birds

Lahontan Reservoir is about a 1 hour drive from Reno, and about a ½ hour drive from Carson City. Access is excellent via State Park, BOR and BLM lands and the streets/roads on Silver Springs. Eastern shore is quite remote. Visibility is good due to relative lack of vegetation. The delta area may need to be assessed in terms of accessibility and visual obstructions. The reservoir's shape allows for fairly comprehensive surveys from the shore line.

Past and Current Surveys

NDOW - N. Saake winter waterfowl surveys 1967-2001
Judd and Gubanich: Gull banding (late1980's, early 90's)
Current:
Bald Eagle Survey: NDOW and NDOP
Hg Study/Blood Chemistry studies on-going - Henry and Hill

Potential Survey Methods:

Description

Fixed wing aircraft, boat and ground surveys all very feasible. Colonial nesters need special attention in survey design.

Selection Bias

None likely due to public ownership.

Measurement Error and Bias

No unusual sources of error and bias expected, but effects of reservoir stage on bird abundance may be extreme and should be addressed in monitoring plan.

Needed Pilot Studies
None needed, except perhaps general assessment of bird use throughout year (particularly role of shorebirds).

Contact with Local Knowledge: Jim Lytle, Lahontan Audubon Society.

7. Washoe Lake

Boundaries and Ownership

Northern Little Lake Washoe separated from Washoe Lake by wetlands of the Scripps Wildlife Management Area. NDOT mitigation wetlands added to historical wetlands at south end of Lake Washoe. Lake levels and wetlands vary with winter precipitation in Carson Range. Washoe Lake and Little Washoe Lake - Nevada State Parks
Scripps Wildlife Management Area (SWMA) - NDOW
Mitigation Wetlands - NDOP, NDOT

Focal Species

Clark's Grebe,
Black-crowned Night-heron, Snowy Egret, Great Egret, White-faced Ibis, Great Blue Heron (all in rookeries in SWMA)
Redhead, Ruddy Duck, Canvasback, Cinnamon Teal, Northern Pintail, Canada Goose
Virginia Rail, Sora
American Avocet, Black-necked Stilt, Willet, Wilson's Phalarope
Black Tern

Location of Type I Habitat

All open water and surrounding marshes possible Type I habitat (in normal and high water years).

Location of Type II Habitat

Type II habitat uncertain, but may be extensive in drought years. Lake and wetlands shallow, so fluctuations in water availability may significantly affect distributions of Type I and II habitats.

Access and visibility of birds

The site is about a ½ hour drive from Reno, and a 15 minute drive from Carson City. Access good from all sides. Visibility hindered only locally by vegetation.

Past and Current Surveys

NDOW - N. Saake annuals air surveys 1967-2001
J. Eidel - weekly survey of whole lake shore 1996-97
None currently

Potential Survey Methods

Description

Fixed wing aircraft surveys and ground surveys probably the best methods. The lake is not big, nor vegetated or complex enough to warrant boat surveys. The majority of priority species probably best counted from the shoreline with spotting scopes.

Selection Bias

None.

Measurement Error and Bias

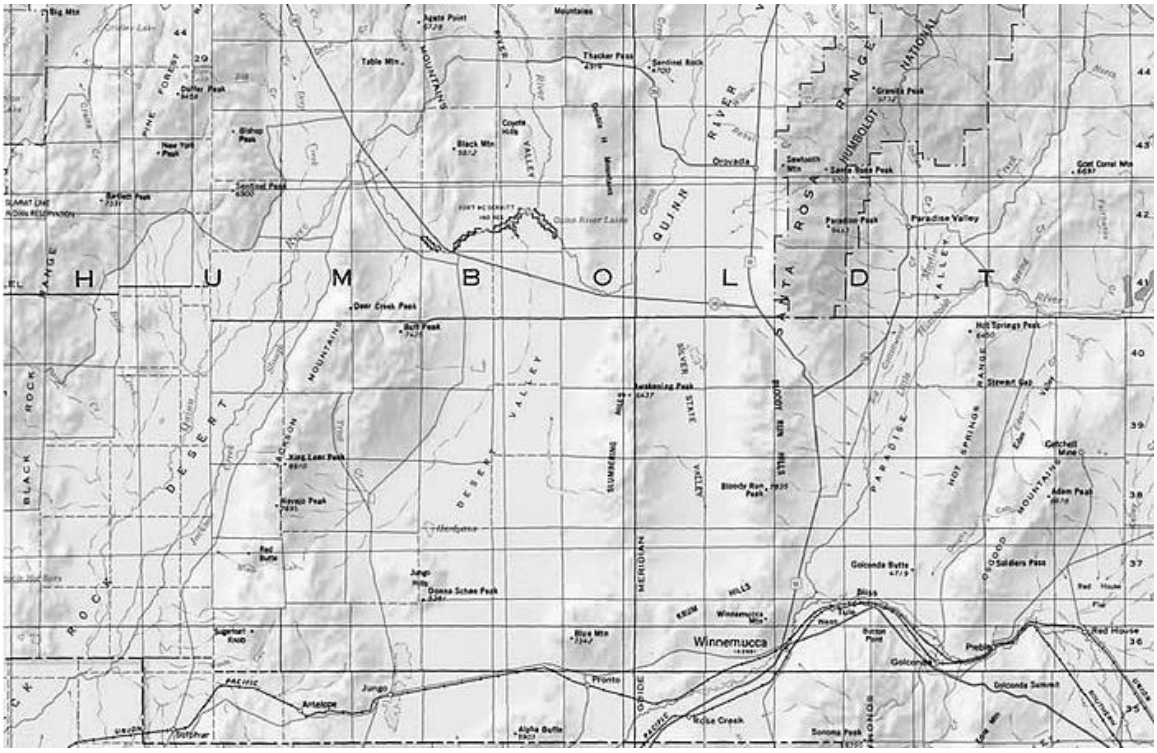
Some error may stem from shoreline surveys being hindered by vegetation density especially during breeding season. Observer variability may also play a role if many surveyors involved.

Needed Pilot Studies

Probably not. J. Eidel's and annual waterfowl surveys should be used for planning.

Contact with Local Knowledge: Jim Eidel, Great Basin Bird Observatory.

8. Quinn and Little Humboldt Rivers



Boundaries and Ownership
These rivers have primarily marshes as a riparian corridor. Therefore, much of the areas around the main stems consist of dispersed wetlands, unless they are modified for agriculture. The site includes all lowland wetlands of the Quinn River drainage between Santa Rosa Mountains, Montana Mountains into the Black Rock Desert; Little Humboldt drainage from Little Humboldt Ranch (east of Chimney Dam Reservoir) through Paradise Valley to confluence with Humboldt River. Owned by BLM and private landowners (ownership dispersed among different parcels).

Focal Species

Greater Sandhill Crane, Long-billed Curlew
Great Egret, Snowy Egret
Great Blue Heron, Black-crowned Night Heron

Location of Type I and II Habitat
River habitat includes rock walls, willow flats and open wetlands with emergent vegetation. Only few areas have open water. Exact delineation of Type I and Type II habitats may need to be determined in pilot study.

Access and Visibility
All sites are about 2 to 3 hours from Reno. Aerial surveys have been done in the past, but were difficult and time consuming. Significant emergent vegetation will be a problem for

secretive and marsh species. Some sites, e.g. Chimney Reservoir, are fairly open with good visibility, but for the most part, emergent marshes are the primary wetland type of this site.

Past & Current Surveys
Aerial counts and discovery flights were done at least sporadically, if not regularly, by NDOW as part of statewide waterfowl monitoring. No other previous surveys known.

Potential survey methods

Description
Aerial counts best for surveying the entire river course, but emergent vegetation may reduce visibility. Sampling of sites should be conducted in ground surveys, but the entire area is probably too extensive for comprehensive counts on the ground.

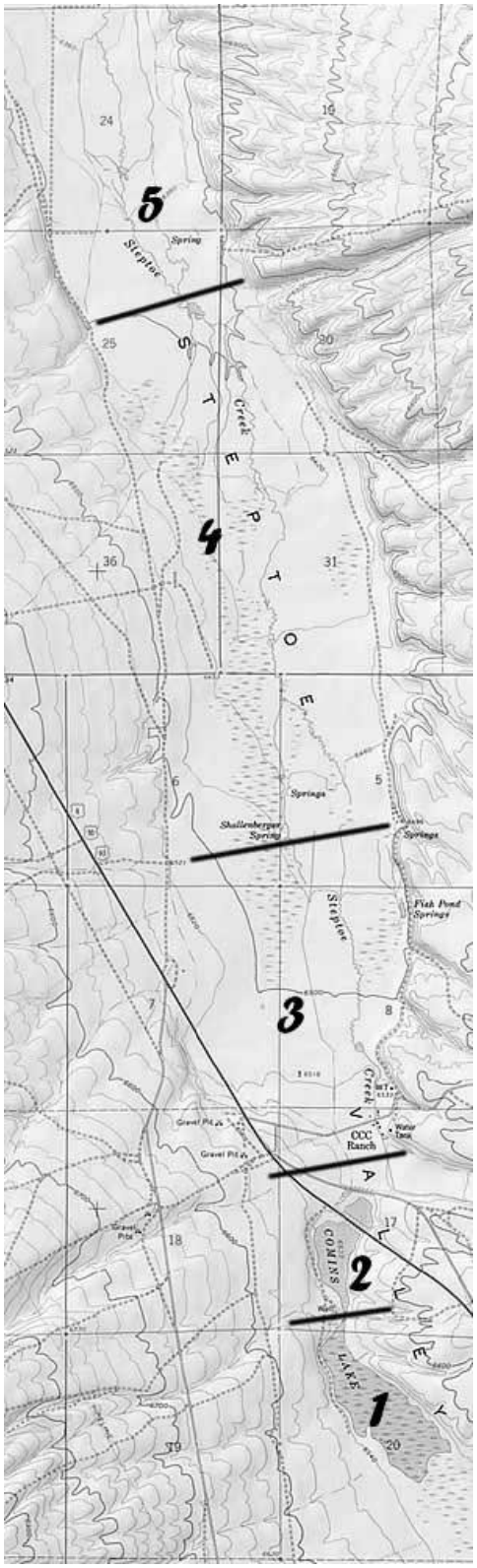
Selection bias
Permission of multiple private landowners needed to be able to access all areas. Some areas may also be very remote (i.e. away from access roads) which may create bias in ground based surveys.

Measurement Error and Bias
Emergent vegetation is a significant factor in measurement error and bias against secretive species for both aerial and ground surveys. Aerial coverage of the site involves a fairly long flight, so observer fatigue may also be a source of error.

Needed Pilot Studies
Delineation of Type I and II habitats and development of survey plan logistics.

Contacts with Local Knowledge: Pete Bradley, NDOW; David McNinch, NDOW.

9. Steptoe WMA



Boundaries and Ownership
All WMA lands are managed by NDOW.
West: From north boundary of T.16N, R. 63E, S. 24 southeast in jagged line to southern boundary of T.15N, R.64E, S. 33
South: Southern boundary of T.15N, R.64E, S. 32-33
East: From east boundary of T.15N, R.64E, S. 33 northeast in jagged line to north boundary of T.16N, R.63E, S. 24.
North: North boundary of T.16N, R.63E, S. 24

Focal Species
Sandhill Crane
Long-billed Curlew
Wilson's Phalarope
Short-eared Owl
Northern Harrier

Location of Type I Habitat
Meadows north of WMA headquarters
Comins Lake and associated marshes
Meadows south of Comins Lake

Location of Type II Habitat
Uplands adjacent to meadows

Access and Visibility of Birds
The site is about 10 minutes from Ely and about 6 hours from the Reno/Carson area. All areas are accessible due to public ownership, and maintenance roads make logistics fairly simple. Some shores of Comins Lake have emergent vegetation which may affect bird visibility. Also, the wet meadow north of the headquarters is subject to a wetland enhancement project after having been used for agriculture. It is expected that ground and shrub vegetation will increase as a result, making visibility of birds an increasing issue.

Past and Current Surveys
All sites have been surveyed regularly during NDOW's aerial waterfowl counts since 1966.

Potential Survey Methods

Description
Aerial and ground surveys are probably the best approach because none of the sites are large enough to warrant boat surveys. All birds can be viewed from the shorelines, except where views are obstructed by vegetation.

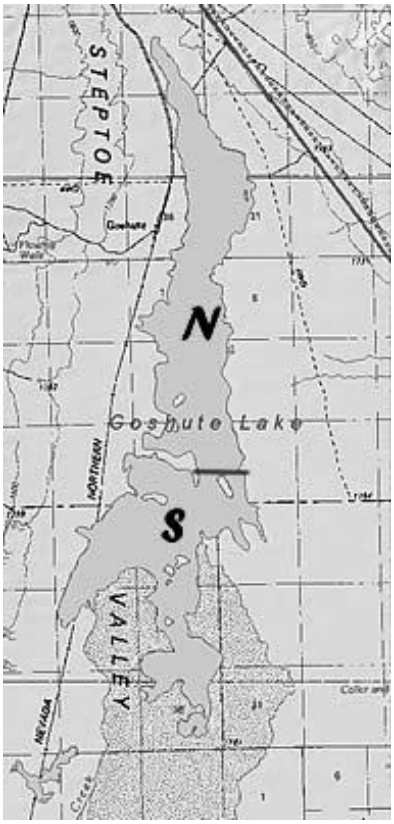
Selection bias
None

Measurement error and bias
Visibility obstructed by emergent vegetation around the lake and, likely in the future, at the wetland enhancement project. The restoration project itself

introduces a “bias” in that habitat is actively created and other habitats may decrease as a result. This will affect the presence and abundance of several species. Also, an overall increase in ground vegetation, therefore visual obstruction, is expected as a result of partially retiring the ranching operation.

Pilot Studies Needed
None
Contacts with Local Knowledge: Larry Neel, Jason Williams, and Scott __?__ of NDOW. Scott is one of the WMA managers and lives on site.

10. Snow Water and Goshute Lakes



Boundaries and Ownership
Snow Water Lake: (Roughly) West boundary: T34N R62E S30; North boundary: T34N R62E S20 and 21,22,25,26,27,28; East boundary: T34N R63E S30,36; South boundary T33N R62E S1,2,3 and T34N R62E S33,34

Goshute Lake: (Roughly) West boundary: T26N R64E S1,12,13,23; North boundary: T27N R64E S35,36; East boundary: T26N R65E S4,9,16; South boundary: T26N R65E S28,29,30 and T26N R64E S30

The lakes are on public lands administered by the BLM.

Focal Species
White-faced Ibis
All dabbling duck species listed in BMR 93 except for wood duck
American coot
All shorebird species listed in BMR 93 except for common snipe

California gull

Type I and Type II Habitats
Playa lakes flooded only during years with above-average mountain snow pack. Reconnaissance flights recommended to determine whether or not Type I habitat exists in any given year. Type II habitat may occur in the same areas in years of moderate water availability, and in some years, no wetlands may exist (Type III habitat).

Access and Visibility
The sites are located about 5-6 hours from the Reno/Carson area and about 1 – 1 ½ hours from Elko. Sites are all accessible, but 4x4 vehicles may be needed to get around to all shores. Due to ephemeral nature of these sites, little emergent vegetation exists that would impact bird visibility. Ground surveys should be done with spotting scopes.

Past and Current Surveys
Snow Water Lake: Ground surveys conducted 1993 and 1995
Goshute Lake: Ground survey conducted 1993

Potential Survey Methods

Description
Reconnaissance flights recommended to determine availability of aquatic habitats and to count large species. Ground surveys are feasible and probably necessary to count smaller species.

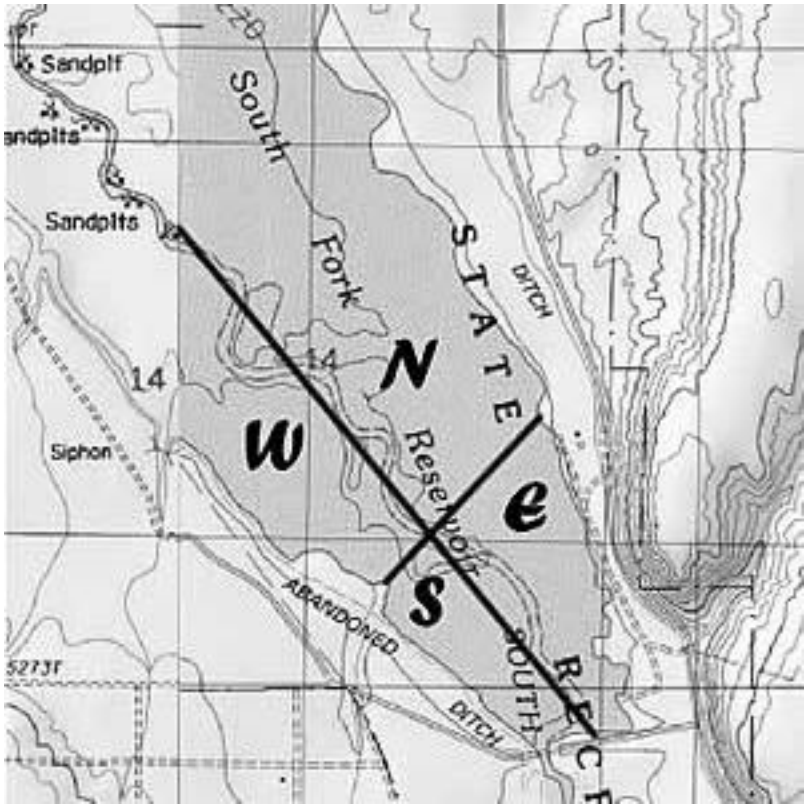
Selection Bias
None

Measurement Error and Bias
No unusual sources of error and bias. In high water years, though, there may be a concern about observer bias due to increased survey area, bird abundance, and species richness. The fluctuating size of the site and observer effort needed for counts also needs to be addressed in the survey plan.

Pilot Studies Needed
None

Contacts with Local Knowledge: Larry Neel and Pete Bradley of NDOW.

11. South Fork Reservoir



Boundaries and Ownership
West: Dam
South: South Fork Humboldt River and south shore of reservoir
East: State HWY 228
North: Tenmile Creek
Landownership is divided among BLM, Paiute/Shoshone Tribes, State of NV, and private landowners.

Focal Species
Greater Sandhill Crane, White-faced Ibis, Wilson's Phalarope, Clark's Grebe, Eared Grebe, Western Grebe, Forster's Tern, Caspian Tern, Western Sandpiper, Least Sandpiper, American White Pelican, Osprey, Common Loon.

Type I Habitat
South Fork Reservoir

Type II Habitat
Tenmile Creek, South Fork Humboldt River

Access and Visibility
The site is about ½ hour south of Elko, and about 4 ½ hours from the Reno/Carson area. Access varies with land ownership. Roads exist around the perimeter, but may not always get one close enough to the wetlands. South Fork Reservoir is also too big to see all birds from the perimeter. Emergent vegetation may also affect visibility of some species in some areas.

Past and Current Surveys
Sandhill Crane surveys since 1976, on 5-year intervals (by NDOW?). Intermittent nesting and migrant shorebird surveys over the years. Christmas Bird Counts.

Potential Survey Methods

Description
All three survey methods (aerial, boat, ground) feasible and at least two needed. Ground surveys only feasible for part of the site, but may be needed for secretive species. Boat surveys would be helpful to cover center of reservoir and hard-to-reach shore areas.

Selection bias
Access may not be complete due to mixed landownership.

Measurement error and bias
Large reservoir with concentrations of shorebirds sometimes at great distances. Observer variability (high bird abundances and species richness). Some error may be associated with emergent vegetation and the species that use it.

Pilot Studies Needed
None, but logistics may need some planning.

Contact with Local Knowledge: Pete Bradley, NDOW.

12. Wildhorse Reservoir

Boundaries and Ownership
West: Humboldt National Forest.
South: North Fork Humboldt River Canyon Road
East: State HWY 225
North: Poorman Creek
Landownership is divided among BLM, Paiute/Shoshone Tribes, State of NV, and private landowners.

Focal Species
Greater Sandhill Crane, Wilson's Phalarope, Clark's Grebe, Western Grebe, Forster's Tern, Caspian Tern, Western Sandpiper, Least Sandpiper, American White Pelican, Osprey, Long-billed Curlew, Common Loon

Location of Type I Habitat
Wildhorse Reservoir

Location of Type II Habitat
Poorman Creek, Riffe Creek, Clear Creek, Deep Creek, Crooked Creek, Jack's Creek, Chicken Creek, Delaware Creek, Owyhee River

Access and Visibility
The site is about 1 hour north of Elko, and about 5 hours from the Reno/Carson area. Access varies with land ownership. Wildhorse Reservoir is too big to see all birds from the perimeter. Visibility?

Past and Current Surveys
Sandhill Crane surveys since 1976, on 5-year intervals (by NDOW?). Intermittent nesting and migrant shorebird surveys over the years.

Potential Survey Methods

Description
All three survey methods (aerial, boat, ground) feasible and at least two needed. Ground surveys only feasible for part of the site, but may be needed for secretive species. Boat surveys would be helpful to cover center of reservoir and hard-to-reach shore areas.

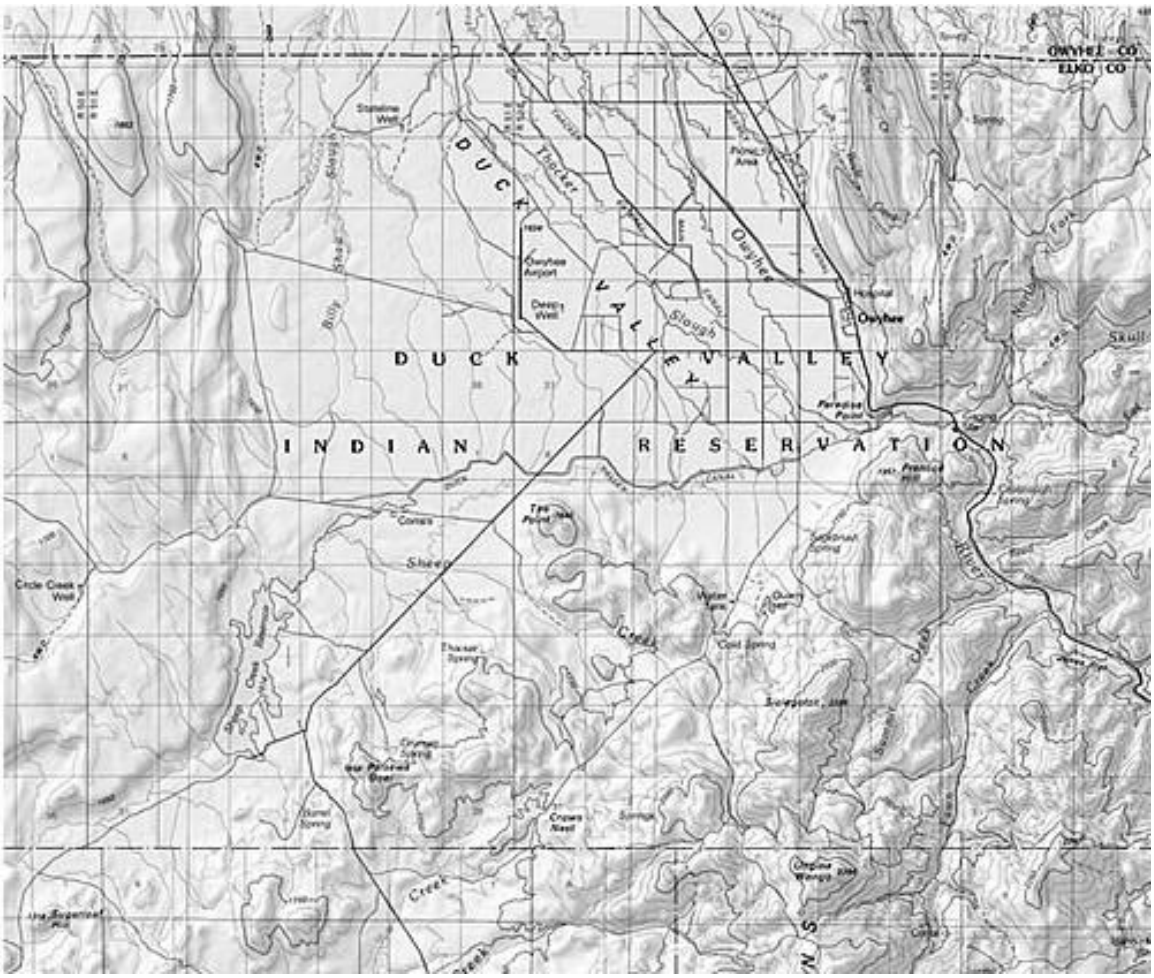
Selection bias
Access may not be complete due to mixed landownership.

Measurement error and bias
Large reservoir with concentrations of shorebirds sometimes at great distances. Observer variability (high bird abundances and species richness). Some error may be associated with emergent vegetation and the species that use it.

Pilot Studies Needed
None.

Contact with Local Knowledge: Pete Bradley, NDOW.

13. Duck Valley Wetlands



Boundaries and Ownership
Wetlands associated with the Sheep Creek drainage (including Sheep Creek Reservoir), Duck Valley Canal, Billy Shaw Reservoir and Slough, Circle Creek drainage (including Circle Creek and Groundhog Reservoirs), Thacker Slough, Owyhee River drainage, Blue Creek drainage, Payne Creek drainage, and Mountain View Lake.

Wetlands exist in both Nevada and Idaho in a portion of T 46N, all of T 47N and 48N, and a portion of 49N; and in a portion of R 50E and all of R 51E and R 52E. The sites are owned by Shoshone-Paiute Tribes and, in Idaho, by private landowners.

Focal Species
All focal waterbird species for BMR 93, except Common Loon, Virginia Rail (but could be present), Common Moorhen, Bonaparte's Gull, Herring Gull, Franklin's Gull, Black Tern (but could be present).

Type I Habitat
All open-water lakes (e.g., Sheep Creek, Billy Shaw, Circle Creek and Groundhog reservoirs), permanent emergent marsh areas, seasonal emergent marsh areas, and meadows adjacent to permanent and seasonal marsh. Exact locations of Type I habitat may need to be delineated in a pilot study.

Type II Habitat
Riparian areas of the streams and Owyhee River.

Access and Visibility
About 1 ½ hours north of Elko, about 2 hours south of Boise, and about 5 ½ hours from the Reno/Carson area. Access to interior areas of emergent marshes and some riparian areas is limited. Lakes, meadows, margins of emergent marshes, and riparian area near roads are generally accessible. Visibility of birds in emergent marsh and some riparian areas is limited, but birds on lakes and reservoirs are generally visible.

Past and Current Surveys
Some data on waterbird presence available from 2001. No systematic surveys in the past or currently.

Potential Survey Methods

Description
Aerial surveys should be used at least for reconnaissance to determine Type I habitat areas and seasonal water availability. They may also be the primary survey method for areas that are difficult to access from the ground. Boat surveys may be of limited use, because most remote sections are marshy areas. Probably a combination of ground subsampling and aerial surveys are the most promising approach.

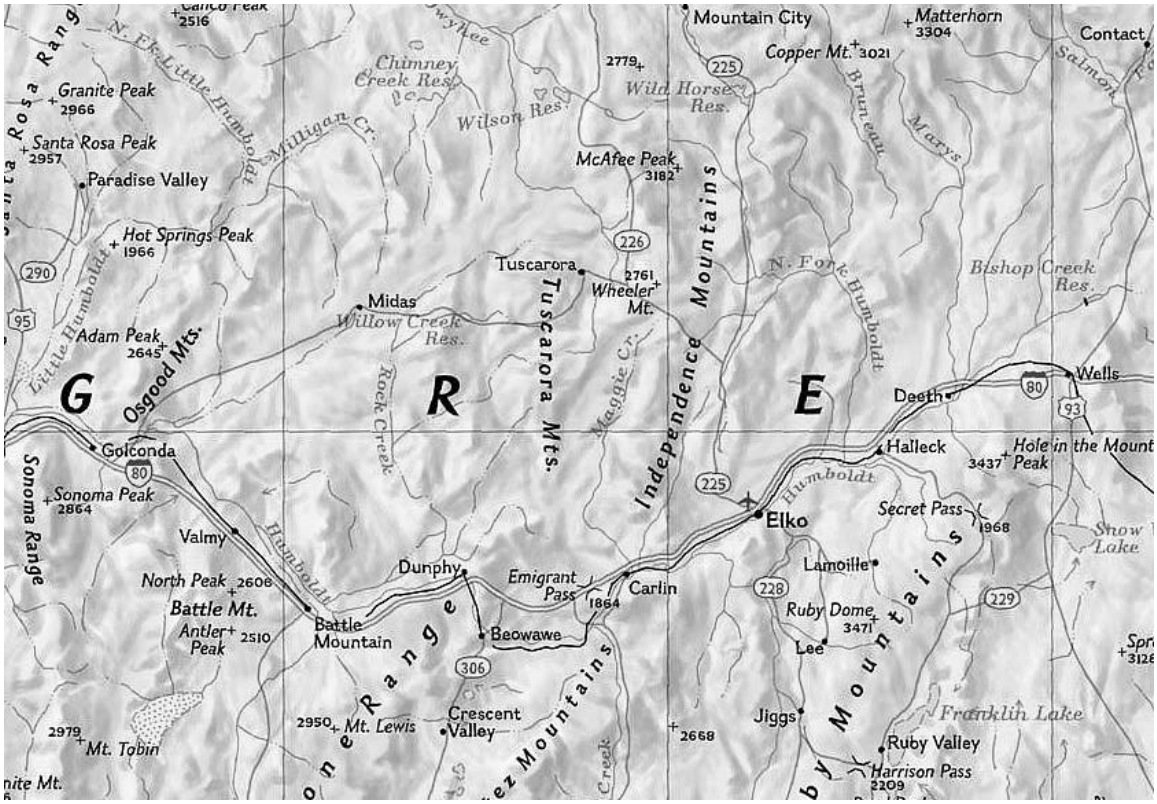
Selection bias
Access to Tribal lands by non-Tribal members, and access to private lands, is subject to permitting. Remote sites may pose logistical issues and may be biased against in ground surveys.

Measurement error and bias
The biggest challenge of this site is bird visibility in emergent vegetation. The site is also fairly dispersed and poses logistical problems that may be a source of error or bias.

Pilot Studies Needed
Pilot studies needed urgently for baseline inventory of species and populations, to delineate Type I habitat, and to document use periods.

Contacts with Local Knowledge: Jake Sellman, Shoshone- Paiute Tribe

14. Upper Humboldt River



Boundaries and Ownership
West: Golconda, NV
South: Beowawe, NV
East: Deeth, NV
North: Orange Bridge- Mary's River
Lands are administered by BLM, as well as in private ownership

Focal Species
Greater Sandhill Crane, White-faced Ibis, Black Tern, Wilson's Phalarope, Snowy Egret, Great Egret, Black-crowned Night Heron, Long-billed Curlew.

Location of Type I Habitat
Wetlands along the Humboldt River and Mary's River.

Location of Type II Habitat
Some wetlands along Rock Creek and Reese River.

Access and Visibility
This area is 0 – 1 ½ hours from Elko and about 2 ½ to 4 hours from the Reno/Carson area. Access varies with land ownership. Visibility is a problem in many areas due to site's complexity and dense vegetation. Canoe survey requires a minimum of 10 days.

Past and Current Surveys
Breeding bird survey done on a 15-year interval by canoe (by NDOW?). Aerial surveys of Sandhill Cranes have been done in 5-year intervals since 1976, and also of ardeids in 5-year intervals since 1989. Intermittent shorebird surveys have also been done over the years. Christmas Bird Counts in Elko and Battle Mountain areas.

Potential Survey Methods

Description
Aerial and canoe surveys may be the best way to survey this area. Access from land is often complicated by road access problems and private lands. Alternatively, ground based surveys may be used to sample the area, rather than attempting a complete count.

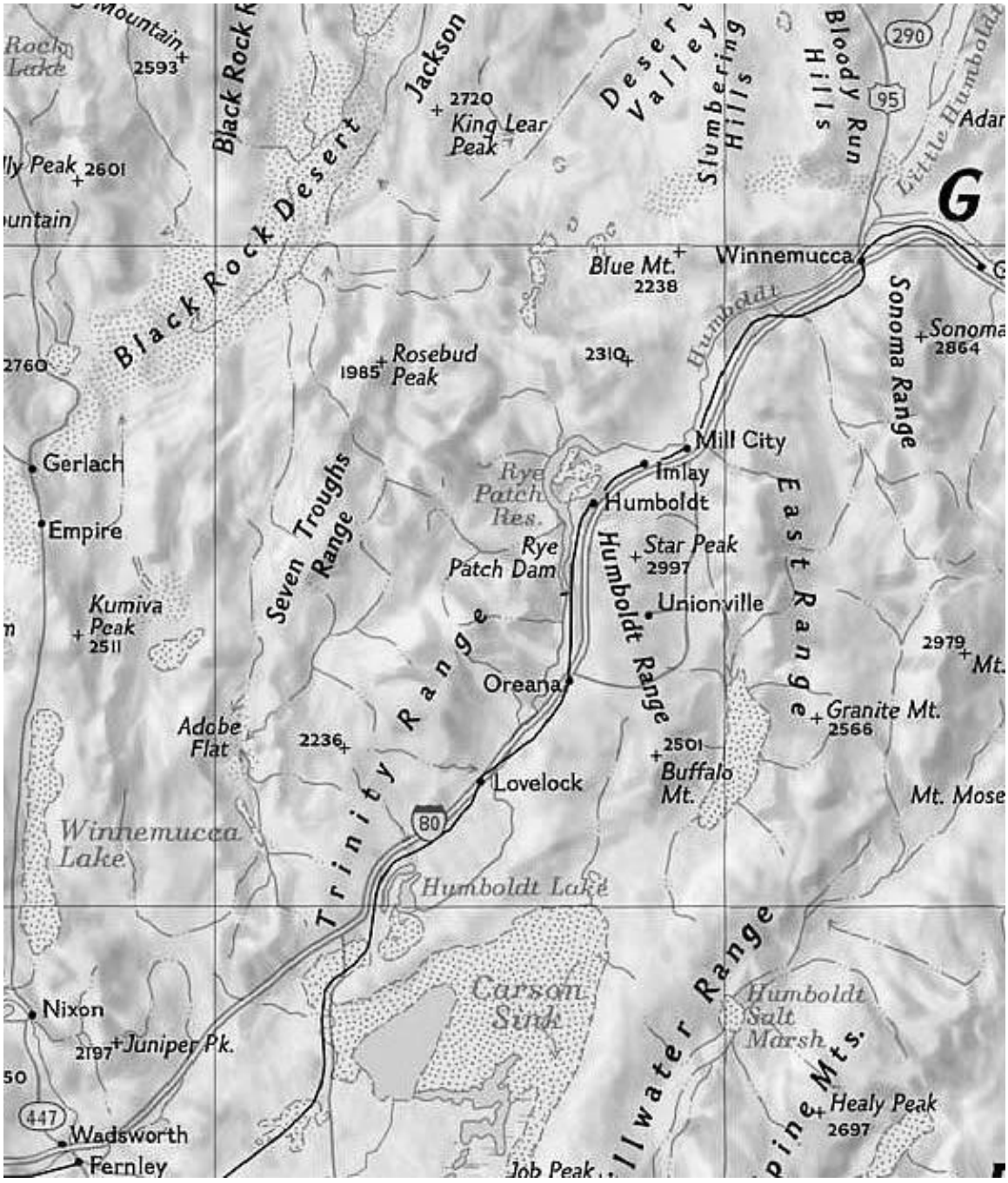
Selection bias
Canoe surveys may carry the bias of leaving out secluded wetland sections and may only provide limited access during low water years. If ground surveys are chosen, private lands may introduce selection bias.

Measurement error and bias
Dense vegetation is a factor in this site, particularly for secretive species. If canoe surveys are done, observers need to be skilled enough to identify species quickly and on the wing.

Pilot Studies Needed
Not necessary if careful planning of surveys is done with the available information.

Contact with Local Knowledge: Pete Bradley, NDOW.

15. Lower Humboldt River



Boundaries and Ownership
North: UTM N 4437096, E 365700 South: UTM N 4417563
E 356673, West: N 4418347, E 354629 East: N 4425856, E 367576
NDOW manages the Humboldt WMA; the Humboldt Sink is partly BLM-administered and partly in private hands.

Focal Species
All shorebirds and a large breeding population of White-faced Ibis when water is present in the Humboldt Sink.

Type I and Type II Habitat
This site is largely ephemeral and only has significant wetlands during high-water years. In such years, Type I habitat is present and consists of open water, some emergent vegetation and adjacent mudflats. Type II habitat is unclear and its distribution varies depending on water year.

Access and Visibility
The site is about 1 hour east of Reno and about ½ hour from Fallon. If an airboat or aircraft is used for surveys, then all areas are accessible and visible. Ground access is possible from east shore and, in years when habitat extends south, from south shore. Visibility is generally very good due to relative lack of emergent vegetation.

Past & Current Surveys
Aerial surveys sporadic since 1977; other surveys conducted opportunistically since 1980's (by NDOW? Larry?).

Potential Survey Methods

Description
In high-water years, aerial boat surveys are probably best method for surveying the Humboldt Sink and the WMA. Wetlands are shallow, so airboat might be the only option for boating. The area is quite extensive when inundated, so canoes are probably not efficient. However, the Humboldt River may lend itself to canoe surveys. Ground surveys may be an efficient method for low water years in the Humboldt Sink area and for the Type II habitat along the Humboldt River. This site will likely need to be subsampled because complete counts may be unachievable.

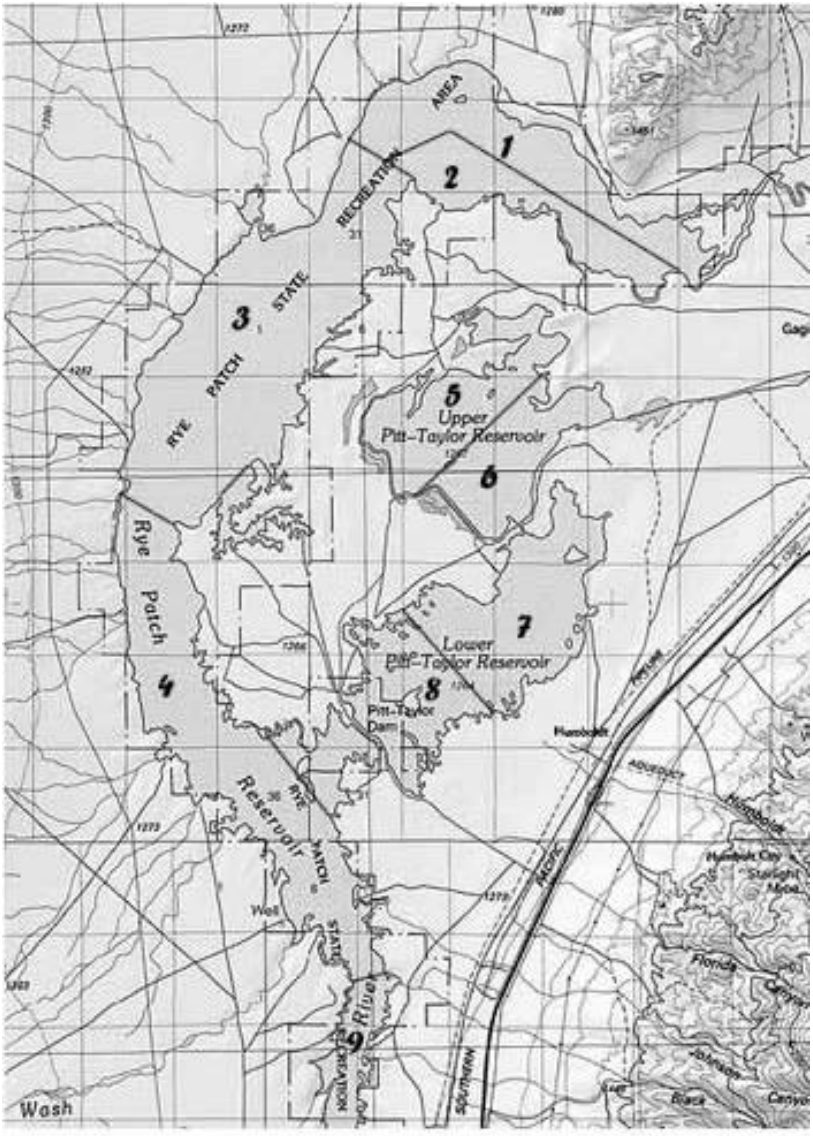
Selection Bias
Private lands at Humboldt Sink and along lower Humboldt River may be a source of selection bias.

Measurement Error and Bias
During high-water years, bird abundance, species richness, and site complexity may all contribute to measurement error due to observer variability. Visibility not a substantial problem for the most part, except in some areas that have permanent marshes.

Needed Pilot Studies
None needed except to work out survey logistics and issues with fluctuating stage of wetlands.

Contacts with Local Knowledge: Larry Neel and Jenny Jeffers of NDOW.

16. Rye Patch Reservoir



Boundaries and Ownership
West: R.32E from T.30N to T.33N
South: T.30N
East: R.33E in T.33N
North: T.33N, R. 32-33E

Lands under the reservoir are owned by the Pershing County Water Irrigation District; shoreline lands above high water mark are owned by State of Nevada (Nevada State Parks); Pitt-Taylor Arm – ownership split between Pershing County Water Irrigation District and USDI (either BOR or BLM).

Focal Species

White-faced Ibis	(Humboldt River Delta)
Snowy Egret	(Humboldt River Delta)
Great Egret	(Humboldt River Delta)
Clark's Grebe	
Western Grebe	
Snowy Plover	
American Avocet	
Black-necked Stilt	

Location of Type I Habitat

Rye Patch Reservoir under regular operating criteria

Location of Type II Habitat

Humboldt River Delta – when emergent wetland appears
Pitt-Taylor Arm – when flooded or wet

Access and Visibility

The site is 1 ½ hours east of Reno. Access is permitted to all areas. Roads exist all around the reservoir, but some may not be immediately at the shore. Visibility is good for most of the reservoir. The site is big enough and access road sparse enough that not all places can be viewed from the perimeter. Humboldt River delta may have emergent vegetation that affects bird visibility.

Past and Current Surveys

All sites have been included aerial waterfowl surveys since 1966.
Aerial surveys for colonial-nesting birds in 1994-95 (Humboldt River Delta)

Potential Survey Methods

Description

All three methods (aerial, boat, ground) feasible. Aerial and boat surveys may be the most efficient and effective methods of getting a full count. Emergent marshes near the delta may need to be done from the ground.

Selection Bias

None

Measurement Error and Bias

Visibility obstructed by emergent vegetation at the Humboldt River Delta. Variability in operation of the dam introduces huge variation in bird numbers. Therefore, observer variability may be an issue depending on habitat availability and bird abundance.

Pilot Studies Needed

None.

Contacts with Local Knowledge: Larry Neel and Pete Bradley of NDOW.

17. Artesia Lake

Boundaries and Ownership
Artesia Lake consists of 3000 acres of wetlands when water is available. The lake is separated west from east by a dike. It was dry from 1988-93 and has again been dry since 2001. The site consists of the Artesia Lake State WMA, which is surrounded by agricultural lands on the north, east, and southwest and by the Honker Hunt Club on the southwest. The west edge of the lake of the lake has salt desert scrub and spring-fed wetlands in the management area.

Focal Species

Clark's Grebe, Western Grebe, White-faced Ibis
Snowy Plover
Canada Goose, Cinnamon Teal, Redhead, Northern Pintail, and other ducks (as many as 30,000 ducks have been counted in high-water years)

Location of Type I and Type II Habitats
All open water and shallow shorelines. Distribution of habitats in this ephemeral lake very much dependent on snowpack and may be entirely dry in some years.

Access and Visibility
This site is about 1 hour from Carson City and 1 ½ hours from Reno. Access is allowed in all areas except in Honker Hunt Club and agricultural areas, where permission is needed. Visibility hindered only locally by vegetation.

Past and Current Surveys:

NDOW's annual mid-winter waterfowl surveys by aircraft 1967-2001
Opportunistic shorebird surveys by Larry Neel (NDOW)

Potential Survey Methods

Description

Ground and aerial surveys probably best approach. The site is too complex and shallow in most areas to lend itself for boat surveys. It can be approached on ground fairly comprehensively, and most if not all birds can be seen from the dike.

Selection Bias

Ground surveys would only be biased by Honker Hunt Club and private lands if permission to access cannot be obtained.

Measurement Error and Bias

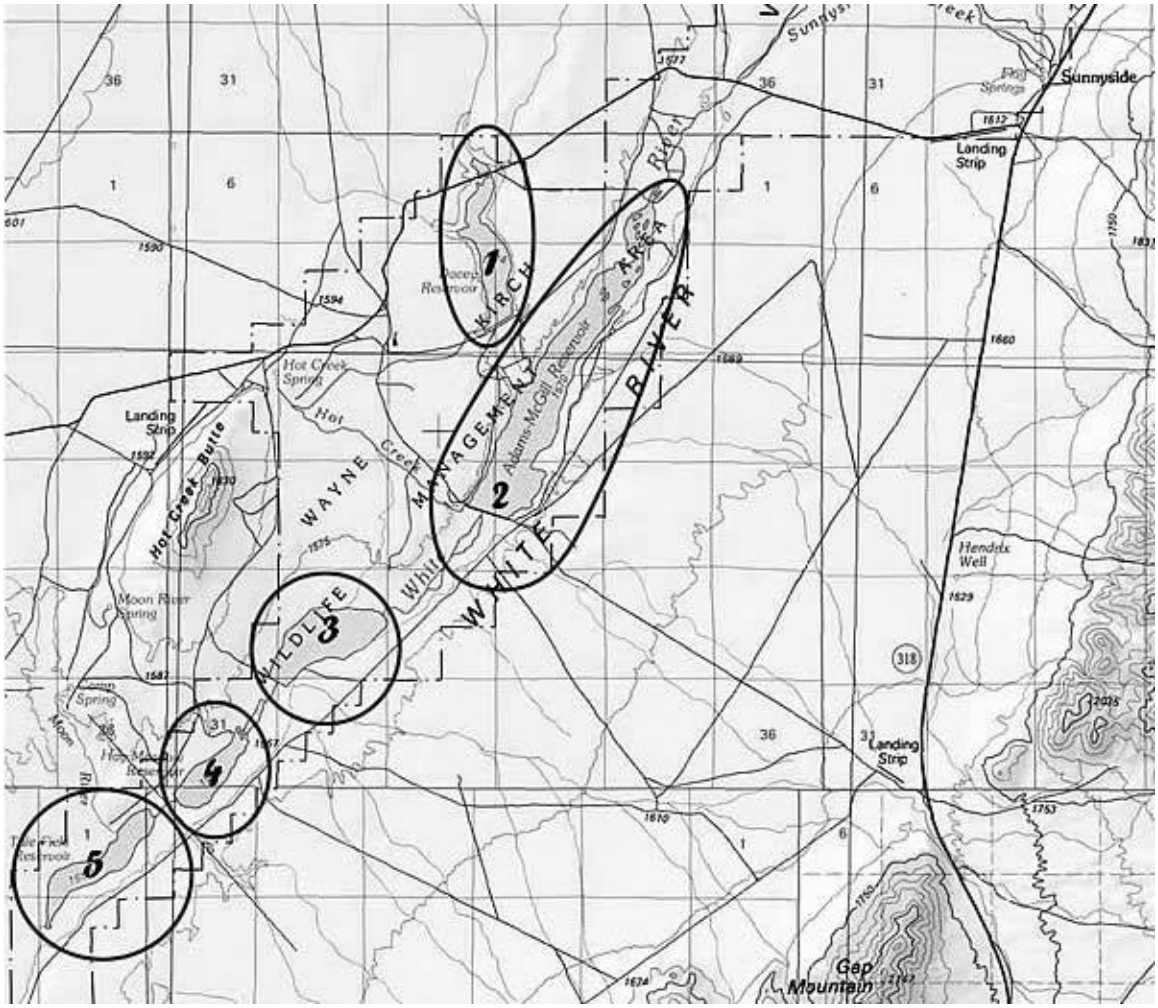
During the breeding season, secretive marsh birds may be difficult to survey. Generally, the site is fairly easily measured, but observer variability may be a factor in high-water years when bird abundance is high.

Needed Pilot Studies

None.

Contact with Local Knowledge: Jim Eidel of Great Basin Bird Observatory.

18. Kirch WMA



Boundaries and Ownership

West:	T 5 N, R 60 E, S 2, 11, and 14
South:	T 5 N, R 60 E, S 13-14
East:	T 7 N, R 62 E, S 28 and 33
North:	T 7 N, R 61 E, S 25 and T 7 N, R 62 E, S 30

Of the 14,814 total acres, 9,221 acres are managed by NDOW and 5,593 acres by BLM.

Focal Species

Double-crested Cormorant	Virginia Rail
American Bittern	Snowy Egret
Great Egret	American Avocet
Great Blue Heron	Black-necked Stilt
Black-crowned Night Heron	Willet
White-faced Ibis	Greater Yellowlegs
Tundra Swan	Spotted Sandpiper
Ruddy Duck	Long-billed Curlew
Canvasback	Marbled Godwit

Northern Pintail
American Widgeon
Gadwall
Sandhill Crane
Wilson's Phalarope
Short-eared Owl
Marsh Wren

Location of Type I Habitat
Adams-McGill Reservoir
Dacey Slough/Reservoir
Cold Springs Reservoir
Haymeadow Reservoir
Tule Reservoir

Location of Type II Habitat
Murphy Meadow
Flagg Spring and outflow
Hot Creek Spring and outflow
Sunnyside Creek

Access and Visibility
The site is about 1 hour south of Ely, and about 2 hours north of Las Vegas. Most areas have good access and bird visibility except for the northern portion of Adams-McGill Reservoir, which may need to be surveyed by canoe or other method.

Past and Current Surveys
Sporadic surveys of shorebirds and other nongame species. Also part of NDOW's statewide aerial waterfowl surveys in mid-winter for several decades. Waterfowl brood surveys have been conducted by NDOW once each year.

Potential Survey Methods

Description
All three methods (aerial, ground, and canoe) are feasible. Adams-McGill Reservoir may need to be done by canoe to capture all species. All other areas can be viewed from the shorelines.

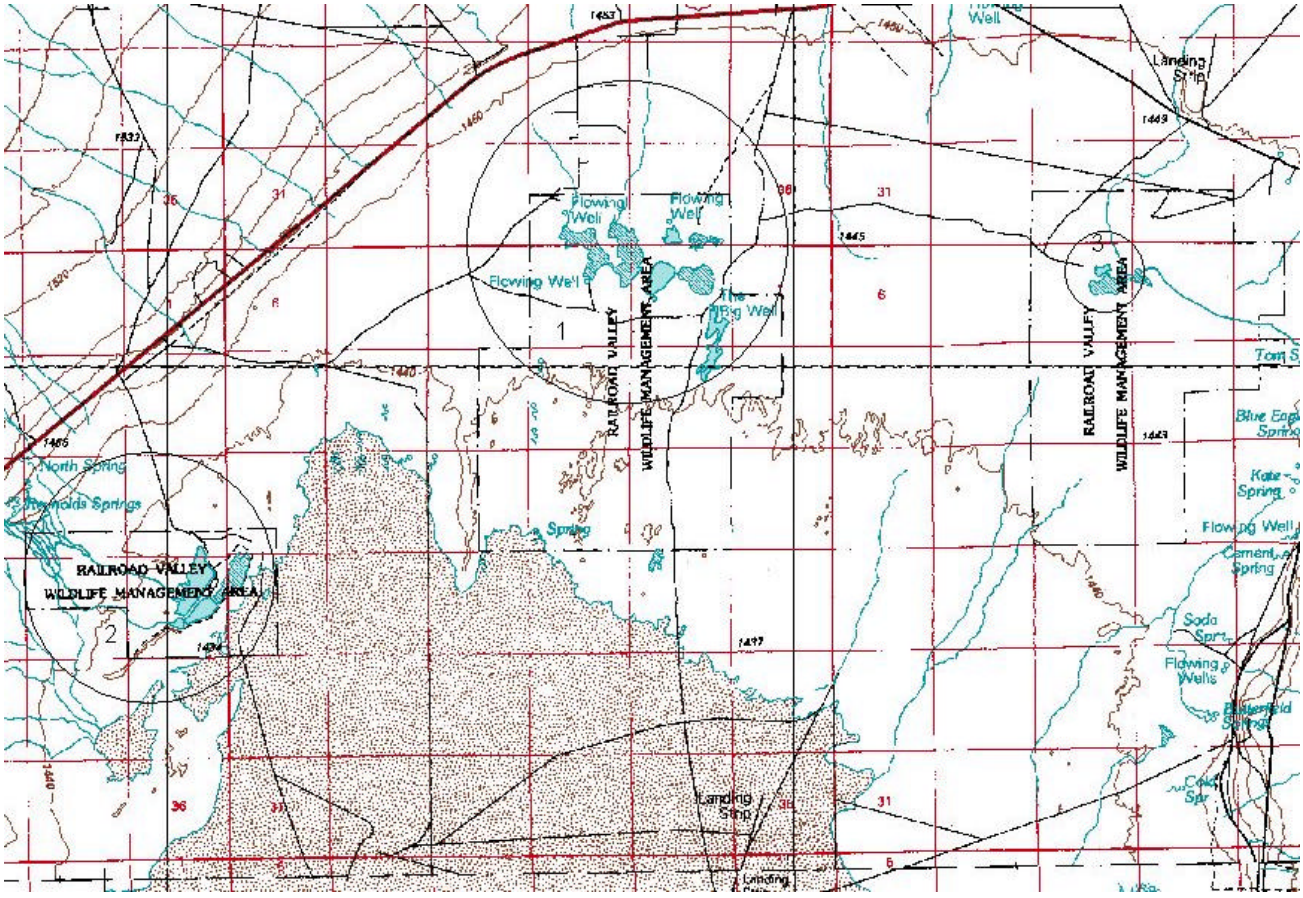
Selection bias
None.

Measurement error and bias
No unusual sources of error and bias.

Pilot Studies Needed
None, except distribution of Type I and II habitats may need to be more precisely delineated.

Contact with Local Knowledge: Cris Tomlinson of NDOW.

19. Railroad Valley



Boundaries and Ownership

Railroad Valley WNA is under BLM ownership and is managed cooperatively through NDOW and the BLM. Railroad Valley WMA is divided in to several sections in Railroad Valley. The west most section is comprised of two ponds (Lockes pond #1 and #2) about 2 miles southeast of Lockes. The Big Well area is about 4 mile northeast of Lockes pond. Blue Eagle pond is about 4 miles to the east of Big Well, and is the eastern boundary.

Focal Species

Snowy Plover
Least Sandpiper
Western Sandpiper
Wilson Phalarope
American Avocet
Black-neck Stilt
Dunlin
Forester's Tern
White-faced Ibis
Mallard
Canada Geese
Green-winged Teal
Cinnamon Teal
Northern Pintail
Eared Grebe

Location of Type I Habitat
Lockes Pond #1 and # 2

Location of Type II Habitat
Big Well Area
Blue Eagle Pond

Access and Visibility
These sites are about a 1-hour southwest of Ely. Access in Railroad Valley to these sites will vary with how much spring moisture there has been. On very wet years dirt access road will be extremely muddy and caution should be taken to avoid getting a vehicle stuck. On dry years access should no be a problem.

Visibility on all of these sights is good to excellent visibility and surveys can be conducted using a spotting scope from an access road.

Past and Current Surveys
A NDOW shorebird survey was conducted in 2003. NDOW has conducted snow plover surveys in Railroad Valley in 1988, 1994, 1997, 2001, and 2003, and plan to continue yearly snowy plover surveys. Lance Brown who now is a USFS Biologist in Tonopah did waterfowl and shorebird use assessment in Railroad Valley in 1995 as part of a senior thesis.

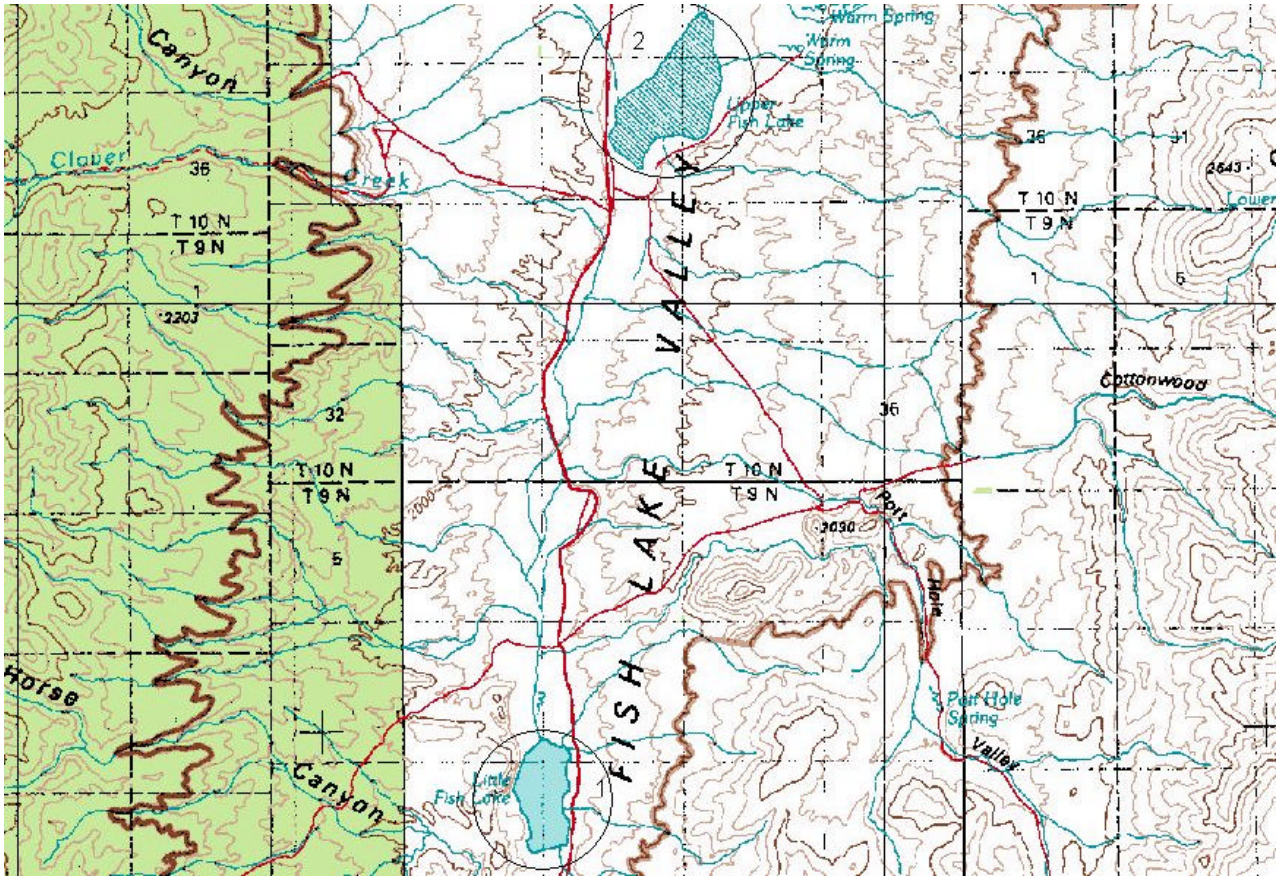
Potential Survey Methods

Description
All areas can be viewed from the shorelines using a spotting scope.
Selection bias
None.
Measurement error and bias
No unusual sources of error and bias.

Pilot Studies Needed
None, except distribution of Type I and II habitats may need to be more precisely delineated.

Contact with Local Knowledge: Brad Bauman and Cris Tomlinson of NDOW. Lance Brown of USFS.

20. Little Fish Lake



Boundaries and Ownership
Little Fish Lake is in TRS T 9 N R 49 E S 9, 10, 15, and 16, and is under about 50% private ownership and the other 50% is administered by the USFS. Upper Fish Lake is in TRS T 10 N R 49 E S 15, 15, 22, and 23, and is approximately 75% private ownership and 25 % is administered by the USFS

Focal Species

Spotted Sandpiper
Least Sandpiper
Western Sandpiper
Semipalmated Plover
American Avocet
Black-neck Stilt
Long-billed Dowitcher
White-faced Ibis
Mallard
Canada Geese
Green-winged Teal
Cinnamon Teal
Northern Pintail

Location of Type I Habitat
Little Fish Lake

Upper Fish Lake

Location of Type II Habitat

Access and Visibility
These sites are about a 1-hour northeast of Tonopah. Access in Little Fish Lake Valley to these sites will vary with how much spring moisture there has been. On very wet years dirt access road will be extremely muddy and caution should be taken to avoid getting a vehicle stuck. On dry years access should no be a problem.

Visibility on these 2 sights is excellent and surveys can be conducted very easily using a spotting scope from an access road.

Past and Current Surveys
NDOW conducted a shorebird and waterfowl survey in 2003. NDOW is planning on conducting annual surveys at Little Fish Lake and Upper Fish Lake.

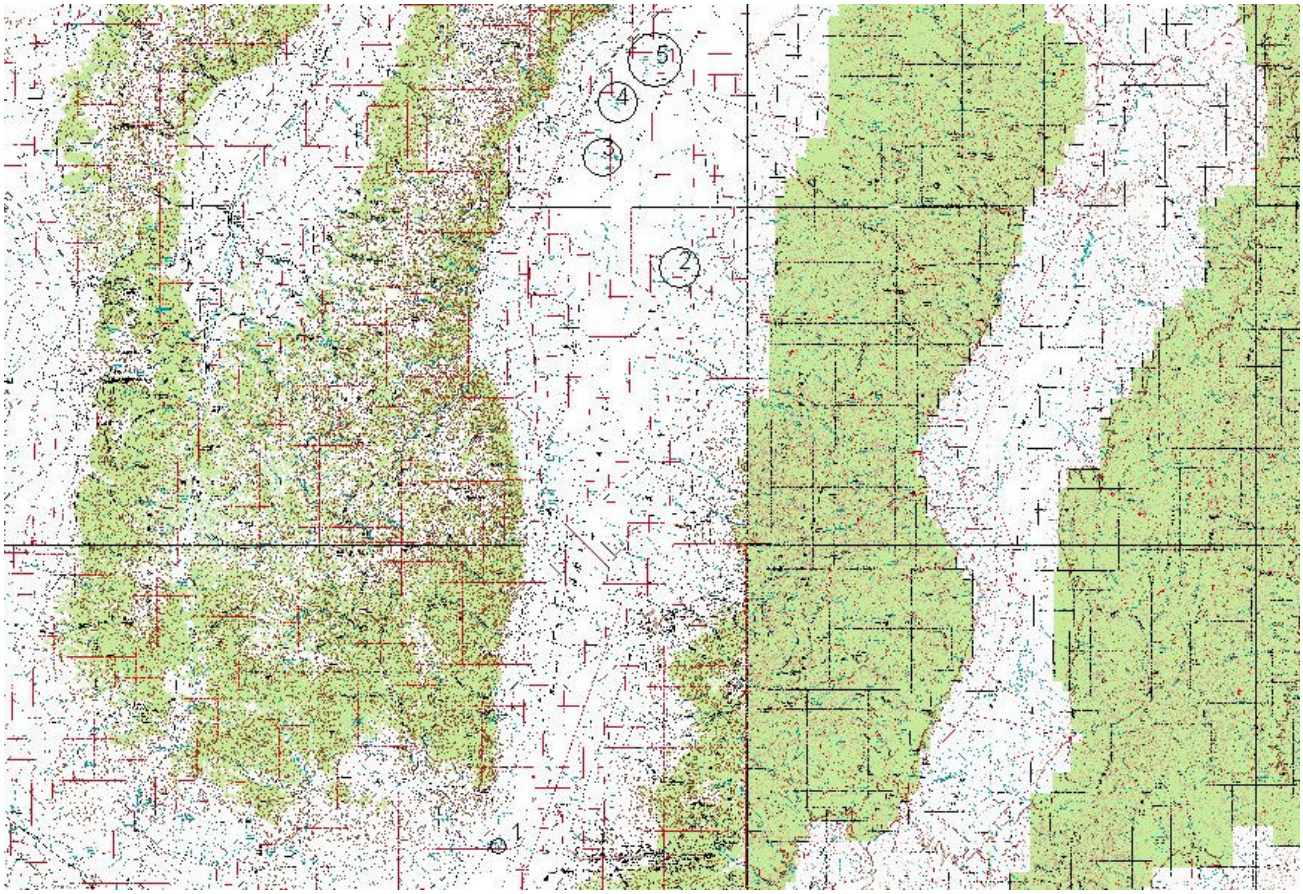
Potential Survey Methods

Description
All areas can be viewed from the shorelines using a spotting scope.
Selection bias
None.
Measurement error and bias
No unusual sources of error and bias.

Pilot Studies Needed
None.

Contact with Local Knowledge: Brad Bauman of NDOW.

21. Big Smokey Valley



Boundaries and Ownership

The northern boundary is roughly the Nye and Lander Counties lines in Big Smoky Valley. The southern boundary is roughly Seyler Reservoir (#1 on map). The western boundary is the Toiyabe Mountain Range, and the eastern boundary it the Toquima Mountain Range. Approximately 20-25 % of the playa lake areas in Big Smoky Valley are under private ownership, and the rest is administered by the BLM.

Focal Species

This list of species is the speculated focal species that could occur in Big Smoky Valley

Spotted Sandpiper
Least Sandpiper
Western Sandpiper
Semipalmated Plover
American Avocet
Black-neck Stilt
Long-billed Dowitcher
White-faced Ibis
Mallard
Canada Geese
Green-winged Teal
Cinnamon Teal
Northern Pintail
Snowy Plover

Location of Type I Habitat

Location of Type II Habitat
All sites will most likely be Type II

Access and Visibility
These sites are about a 1-1.5hours north of Tonopah. Access into these sites will vary with how much spring moisture there has been. On very wet years dirt access road will be extremely muddy and caution should be taken to avoid getting a vehicle stuck. On dry years access should no be a problem.

Visibility on these should be good to excellent and surveys can most likely be conducted using a spotting scope from an access road.

Past and Current Surveys
There are no know surveys that have been conducted in Big Smoky Valley

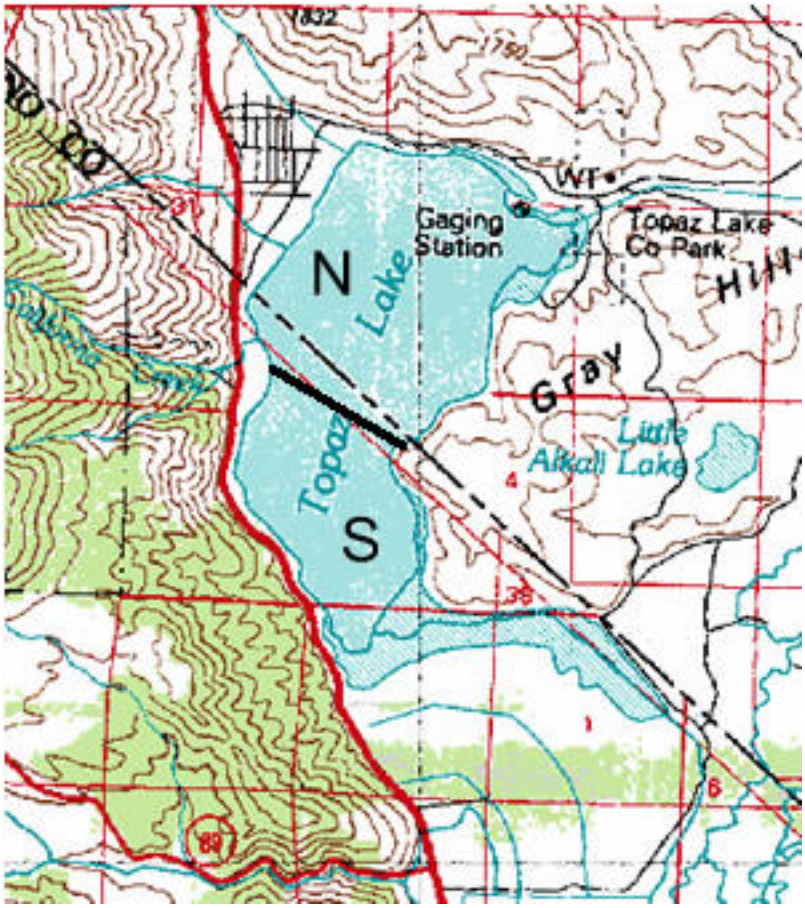
Potential Survey Methods

Description
All areas can be viewed from the shorelines using a spotting scope.
Selection bias
None.
Measurement error and bias
No unusual sources of error and bias.

Pilot Studies Needed
Delineate which sites are Type I and Type II, and look for other important sites in Big Smoky Valley.

Contact with Local Knowledge: Brad Bauman of NDOW.

22. Topaz Lake (needs to be completed)



Boundaries and Ownership

Focal Species

Location of Type I Habitat

Location of Type II Habitat

Access and Visibility

Past and Current Surveys

Potential Survey Methods

Description

Selection bias

Measurement error and bias

Pilot Studies Needed

Contact with Local Knowledge:

23. Carson Valley (needs to be completed)

--- map ---

Boundaries and Ownership

Focal Species

Location of Type I Habitat

Location of Type II Habitat

Access and Visibility

Past and Current Surveys

Potential Survey Methods

Description

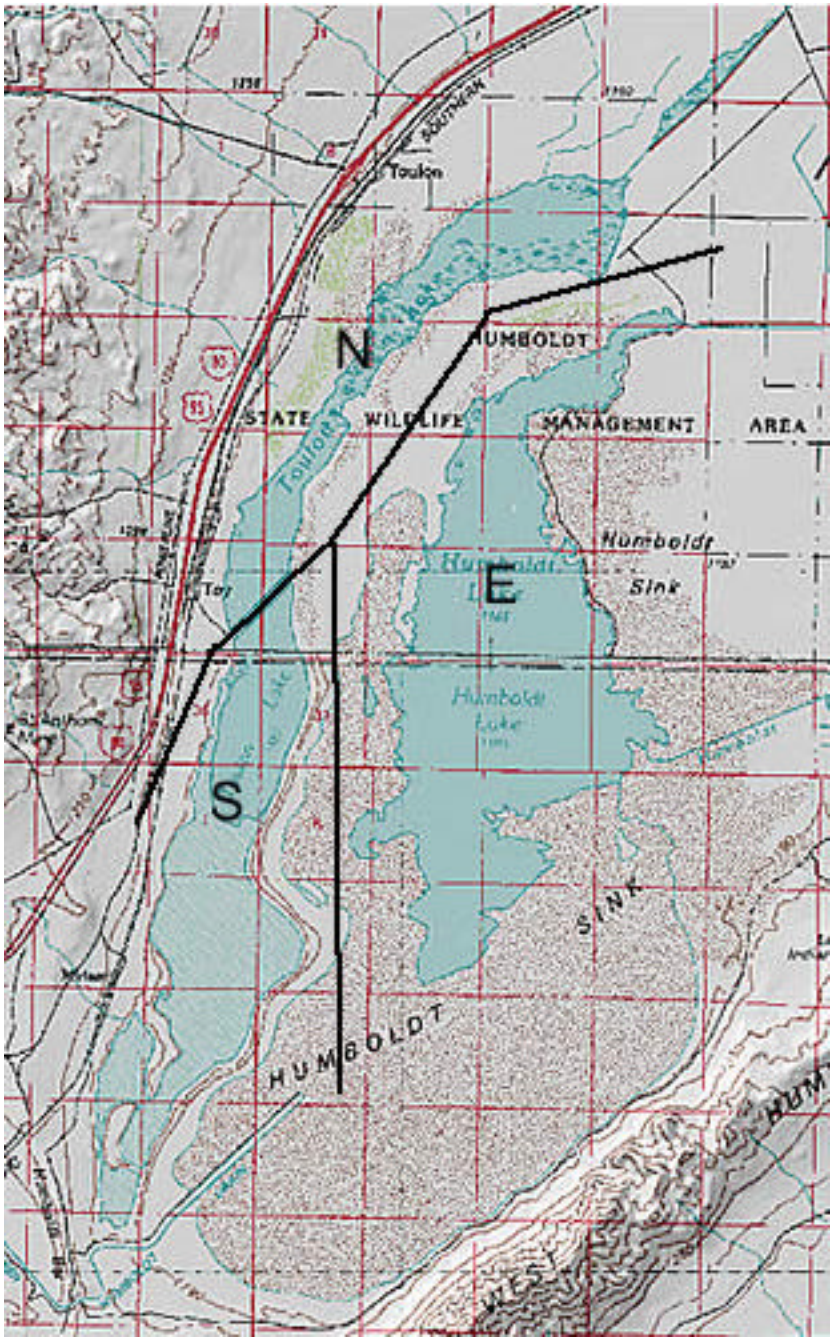
Selection bias

Measurement error and bias

Pilot Studies Needed

Contact with Local Knowledge:

24. Humboldt Sink (needs to be completed)



Boundaries and Ownership

Focal Species

Location of Type I Habitat

Location of Type II Habitat

Access and Visibility

Past and Current Surveys

Potential Survey Methods

Description

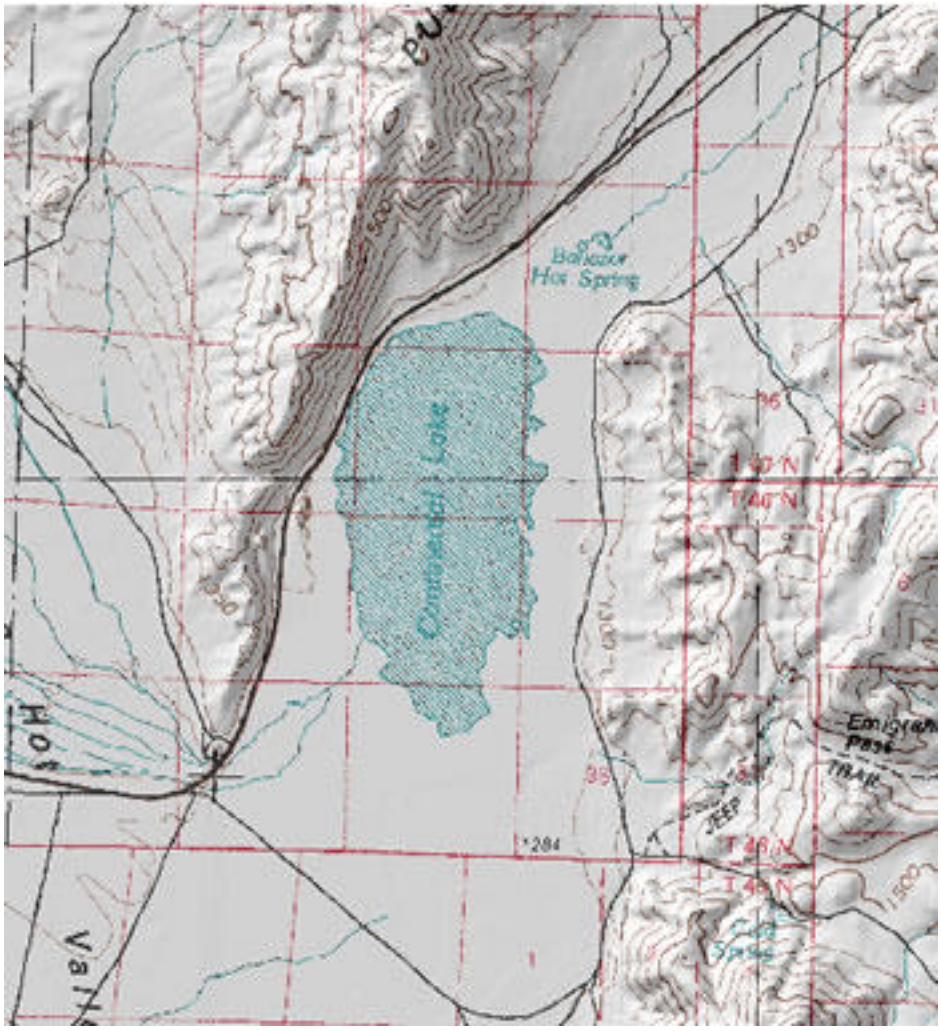
Selection bias

Measurement error and bias

Pilot Studies Needed

Contact with Local Knowledge:

25. Continental Lake (needs to be completed)



Boundaries and Ownership

Focal Species

Location of Type I Habitat

Location of Type II Habitat

Access and Visibility

Past and Current Surveys

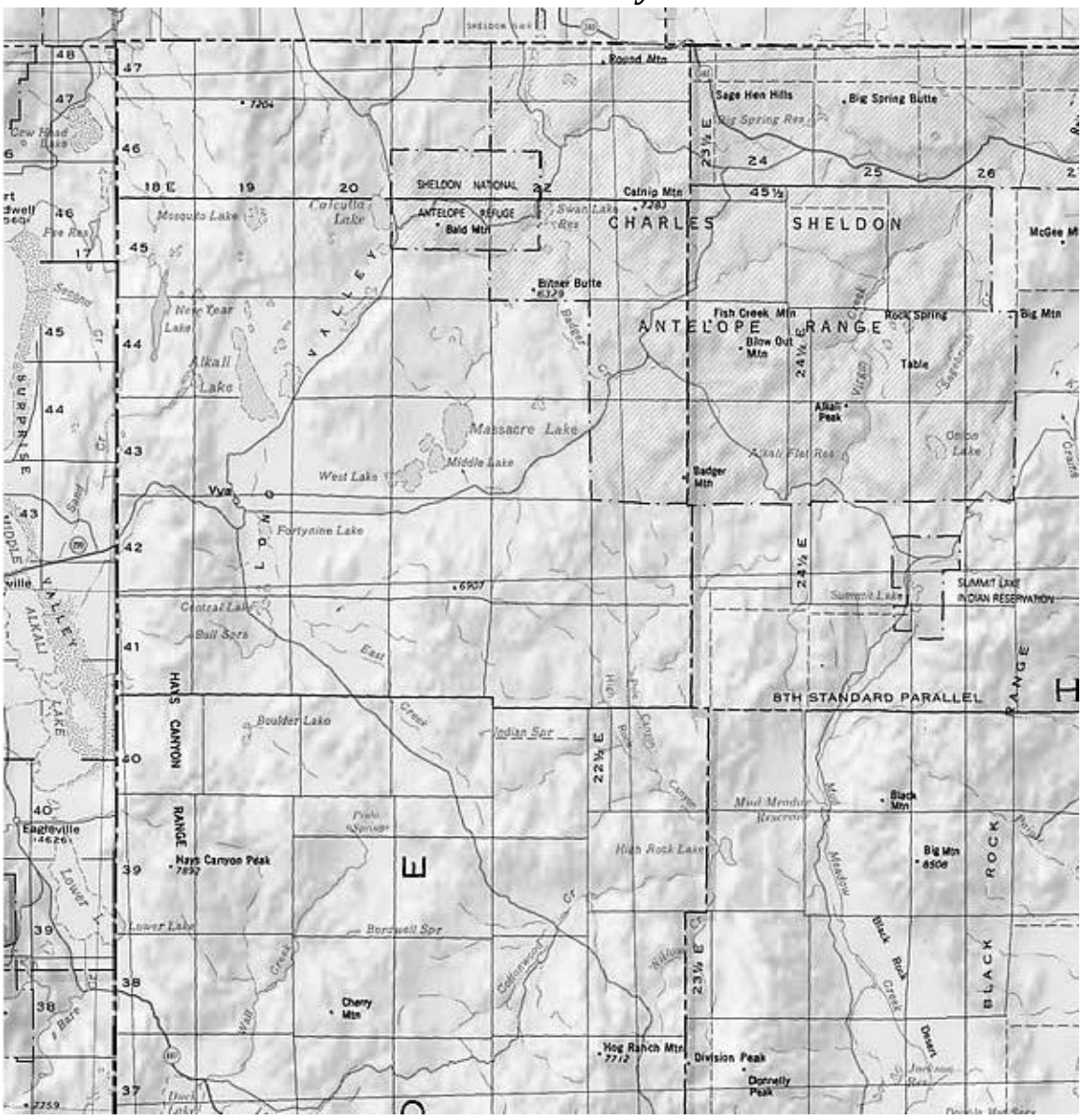
Potential Survey Methods
Description
Selection bias

Measurement error and bias

Pilot Studies Needed

Contact with Local Knowledge:

Stratum 2. NW Nevada Lakes and Playas



Boundaries and Ownership

West: California/Nevada state line from Oregon/Nevada state line south to parallel with Gerlach, NV.

South: California/Nevada state line to Gerlach

East: A northeast vector from Gerlach to Denio

North: Oregon/Nevada state line from Denio to California/Nevada state line

Landownership is as follows:

BLM – most of it

USFWS – Sheldon NWR

Private – Duck Lake

Tribal – Summit Lake

Focal Species

Sandhill Crane
Snowy Plover
American Avocet
Black-necked Stilt
Long-billed Curlew
Wilson's Phalarope
migrant shorebirds
Forster's Tern
Black Tern

Location of Type I Habitat

Duck Lake
Alkali Lake
Mosquito Lake
Calcutta Lake
Cowhead Lake
Massacre Lakes
Swan Lake Reservoir
IXL Ranch
Catnip Reservoir
Big Springs Reservoir
Bald Mountain Lake
Gridley Lake
Continental Lake
Fly Reservoir

Location of Type II Habitat

Wall Canyon Reservoir
Boulder Reservoir
Black Rock Desert
Smoke Creek Desert
Summit Lake

Access and Visibility

All sites are remote and with few or no accommodations. The nearest big town is Reno, about 1 ½ to 2 hours south. Once there, almost all sites are accessible and most birds are visible from perimeter. Duck Lake is too big to see all birds from the perimeter whether wet (Black Terns) or dry (Long-billed Curlews) and requires aerial survey or permission to access by canoe/boat from private landowner.

Past and Current Surveys

All sites have been surveyed systematically via aerial NDOW waterfowl survey since 1966.
Snowy Plover breeding surveys – 1987; 1988; 1992; Herman, et al 1980
Spring Shorebird Surveys – 1990-91
Fall Shorebird Surveys – 1995-2000 (sporadic, not every year)

Potential Survey Methods

description

All three basic survey methods (aerial, ground, boat) possible. This site needs to be subsampled due to its complexity and remoteness. The subsampling may involve a set of permanent sites that can be easily covered and a random selection of other sites that are used to estimate bird numbers in the remaining sites.

selection bias

Duck Lake – private land, permission needed
Black Rock Desert – physical access can be challenging
Smoke Creek Desert – physical access can be challenging
measurement error and bias
Large concentrations of shorebirds sometimes at great distances – all sites
Visibility obstructed by emergent vegetation at Duck Lake
Observer variability

Pilot Studies Needed

Probably not necessary due to past and ongoing surveys, except to work out feasibility, logistics, and costs of increased coverage in dispersed small sites.

Contact with Local Knowledge: Larry Neel (NDOW)

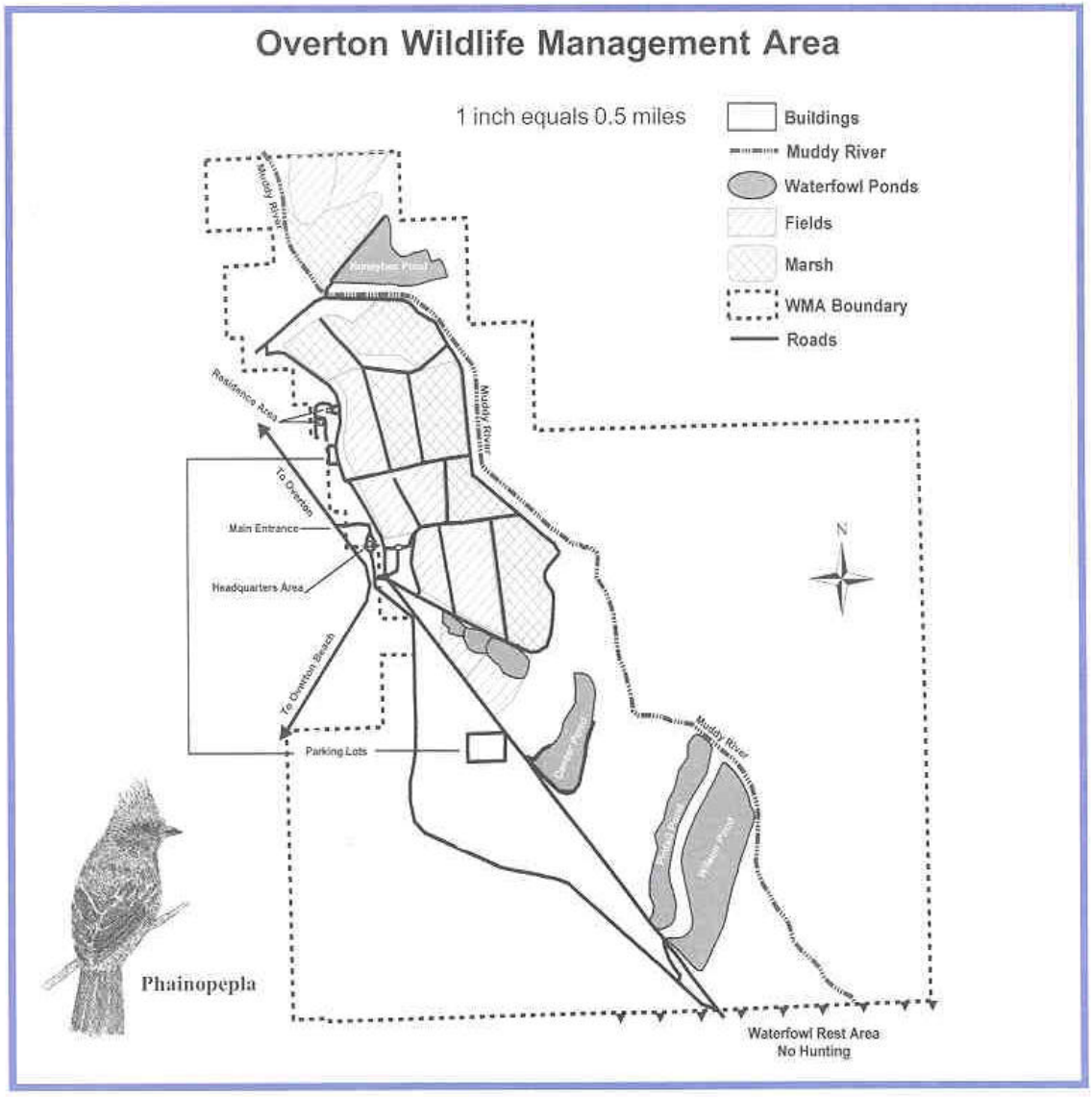
Stratum 3. North-Central Nevada

(*to be completed*)

V. Descriptions for BMR 94: Nevada - Mojave

Stratum 1: Designated Sites

1. Overton WMA



(map from NDOW brochure about Overton WMA; not to scale)

Boundaries and Ownership

Overton WMA is located just south-east of the town of Overton at the entry of the Muddy River into Lake Mead. It includes the delta area at the reservoir entry and several managed wetland cells and pasture areas of the WMA. The land is managed by NDOW.

Focal Species
Northern Pintails, Green-winged Teal, Mallard, Ruddy Duck, Cinnamon Teal, Redhead, (Tundra Swan), White-faced Ibis, Long-billed Curlew, Great Blue Heron, Snowy Egret, Great Egret, Black-crowned Night-heron, Black-necked Stilt, American Avocet, most other migrant shorebird, most grebes, most terns, American White Pelican.

Location of Type I and Type II Habitats

All permanent ponds are probably Type I habitat, including Honeybee, Center, Pintail, and Wilson ponds. The marsh areas may be Type I habitat for some focal species, such as shorebirds and waders. Water supply to the wetland cells is actively managed, so distribution of both habitat types may need to be determined in pilot studies or at the beginning of each survey.

Access and Visibility
The site is about 1 ½ hours north of Las Vegas. Most areas have good access due to dike roads and decent bird visibility except in some areas of the permanent ponds with emergent vegetation. These may need to be surveyed by canoe or other method.

Past and Current Surveys
Sporadic surveys of shorebirds and other nongame species. Also part of NDOW's statewide aerial waterfowl surveys in mid-winter for several decades. Waterfowl brood surveys have been conducted by NDOW once each year.

Potential Survey Methods

Description
All three methods (aerial, ground, and canoe) are feasible. Most if not all areas can be viewed from the shorelines which may make it feasible to do complete surveys from land.

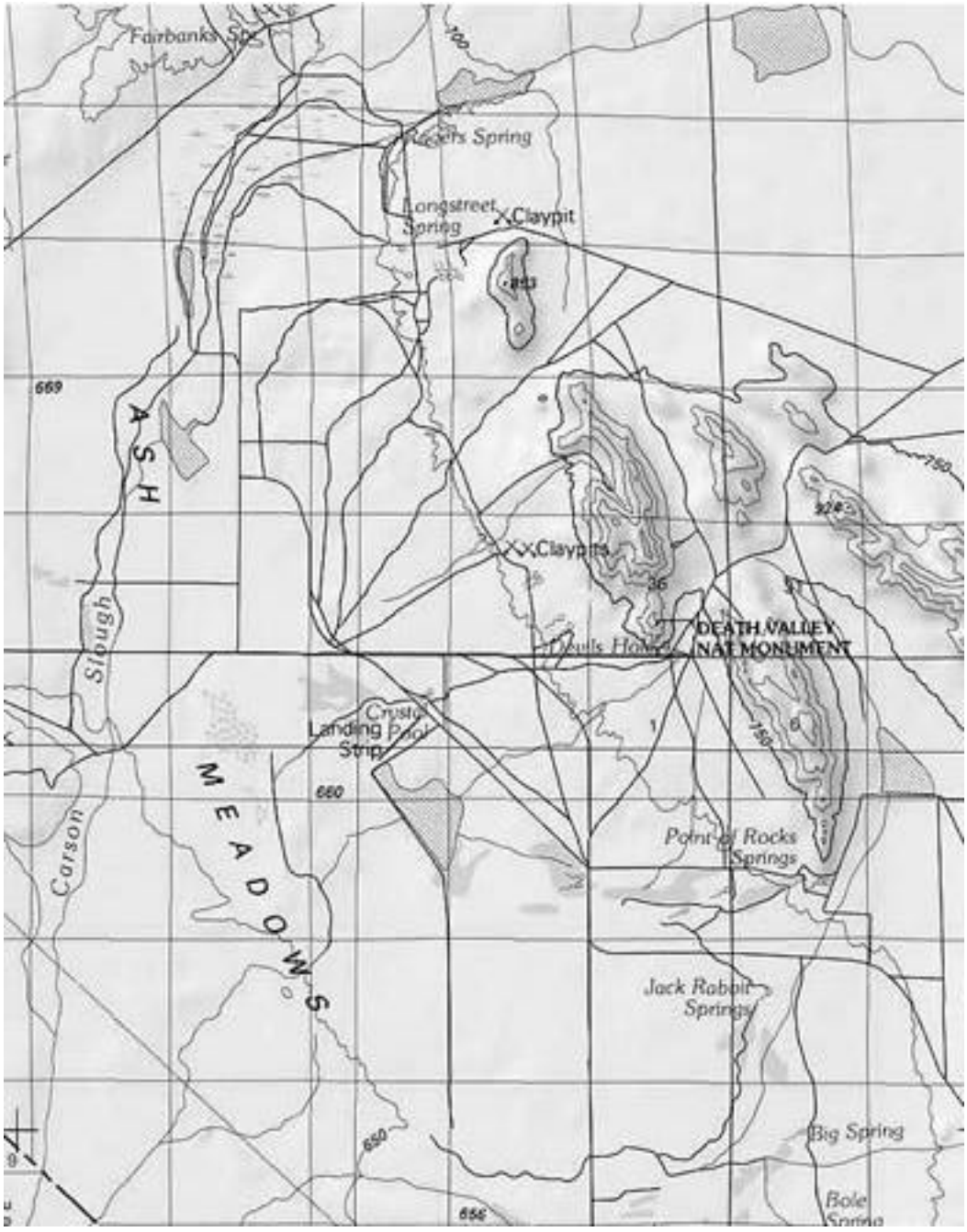
Selection bias
None.

Measurement error and bias
No unusual sources of error and bias.

Pilot Studies Needed
None, except distribution of Type I and II habitats may need to be more precisely delineated.

Contact with Local Knowledge: Cris Tomlinson of NDOW.

2. Ash Meadows NWR



Boundaries and Ownership

West:	T 17 S, R 50 E, S 19 and 30
South:	T 18 S, R 50 E, S 25 and 26, T 18 S R 51 E, S 30
East:	T 18 S, R 51 E, S 8, 17, and 20
North:	T 17 S, R 50 E, S 9

Ownership is divided among FWS (NWR area), BLM, private (American Land Conservancy and several small entities) and NPS (at Devils Hole spring).

Focal Species

White-faced Ibis
Snowy Egret
Great Egret
Green Heron
Black Tern
Clark's Grebe
Great Blue Heron
Western Grebe
Black-crowned Night Heron
American Avocet
Black-necked Stilt
American Bittern
Least Bittern

Location of Type I Habitat

Peterson Reservoir
Horseshoe Reservoir
Lower and Crystal Reservoir

Location of Type II Habitat

Carson Slough, Point of Rocks Spring

Access and Visibility

Ash Meadows is about 2 hours northwest of Las Vegas and about ½ hour from Pahrump. Most sites have good access and bird visibility except for Carson Slough, which has only foot access and limited visibility due to emergent vegetation.

Past and Current Surveys

Site has been surveyed sporadically from the ground for waterfowl and shorebirds. Not known to be included in statewide aerial surveys.

Potential Survey Methods

Description

Three survey methods are feasible (aerial, ground, canoe), but ground surveys may be the most realistic approach, because most sites are small and open with good access roads.

Selection bias

None, except at Carson Slough where access may be limited by logistics and in areas that are private.

Measurement error and bias

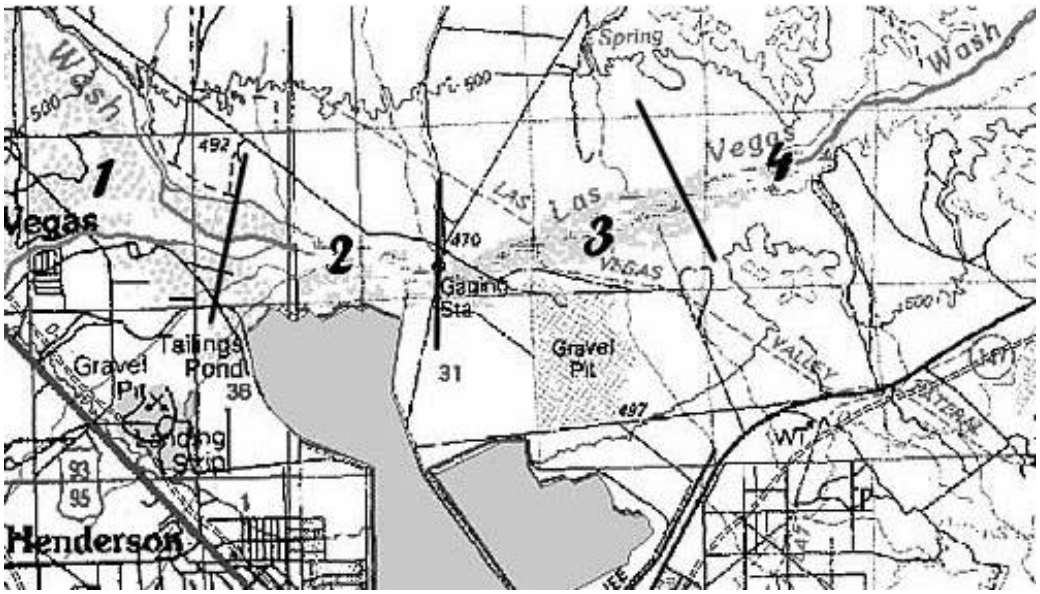
No unusual sources of error and bias, but secretive marshbirds may be underrepresented in visual surveys.

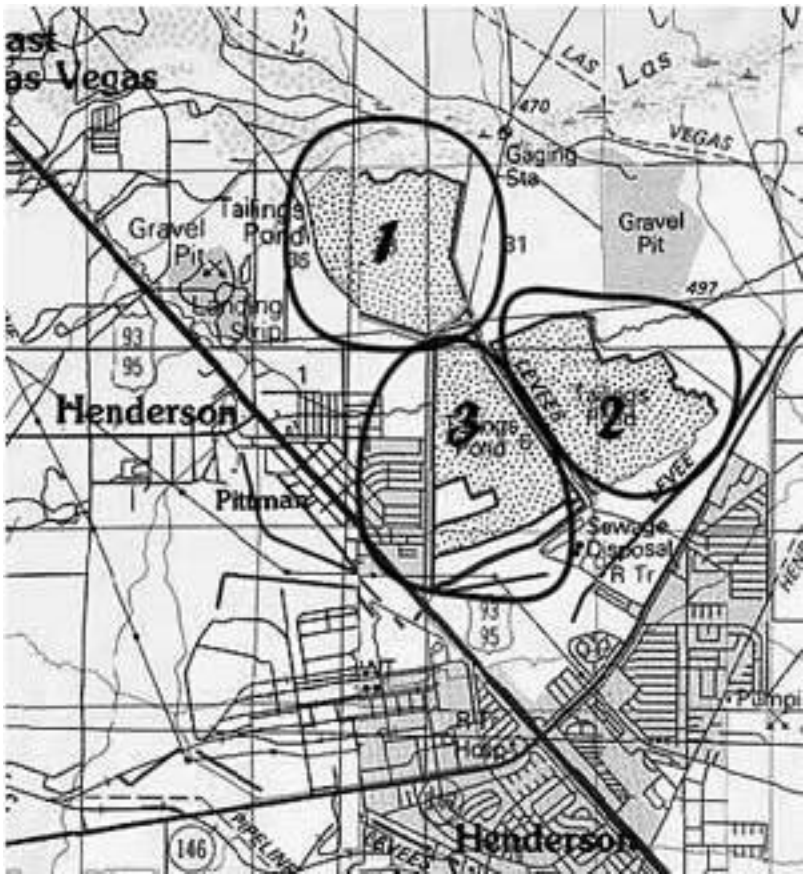
Pilot Studies Needed

None

Contact with Local Knowledge: Sharon McKelvey of Ash Meadows NWR.

3. Las Vegas Wash and Henderson Sewage Plant





Boundaries and Ownership

West: T 21 S, R 62 E, S 23-26

South: T 21 S, R 62 E, S 25-26 and T 21 S, R 62 E, S 28-30
East: T 21 S, R 63 E, S 21, 28-30
North: T 21 S R 62 E, S 23-24 and T 21 S, R 63 E, S 21, 29, 30
Ownership is divided among Clark County (1,550 acres), BOR (1,100 acres) and private lands (180 acres; Clark County working on acquiring private parcels)

Focal Species

Pied-billed Grebe
Eared Grebe
Great Blue Heron
White-faced Ibis
Virginia Rail
Yuma Clapper Rail
Black-crowned Night Heron
American Avocet
Black-necked Stilt
Green Heron
Least Bittern

Location of Type I Habitat

Nature Preserve
Series of Weirs (Pabco, Bostic, Demonstration)
DU Project Site
Henderson Sewage Plant for migrant waterbirds and waterfowl

Location of Type II Habitat

Main Wash channel between weirs
Saltbush uplands, adjacent to wash channel.

Access and Visibility

The site is immediately SE of the city of Las Vegas. Most sites have good access and bird visibility except for the Wash Channel. The channel will require additional bank access or water access. Currently the DU Project site is dense and visibility is limited. In the near future access points will be constructed.

Past and Current Surveys

Several groups have surveyed site, including area searches by staff from the Las Vegas Wash Coordination Committee and volunteers from Red Rock Audubon Society. An ongoing point count monitoring program is funded by Southern Nevada Water Authority. Annual Winter Christmas Bird Counts conducted by the Red Rock Audubon Society since the early 1970's.
SWCA, Inc. has conducted endangered species surveys in the portion of the wash bounded by the Wetlands Park. A Programmatic Biological Assessment (Dec. 2000) was prepared for the Clark County Wetlands Park; survey results are presented for the years 1998, 1999, and 2000. Species occurrence and abundance list is available for the area. Henderson Sewage plant is a popular birding destination.

Potential Survey Methods

Description

Three methods are possible (aerial, ground, canoe), but likely, the most important method will be ground based surveys. Most wetland areas are small enough that

they can be approached and surveyed from land, and canoe surveys may only be needed for hard-to-view areas.

Selection bias

Possible bias from private lands. All others should be accessible.

Measurement error and bias

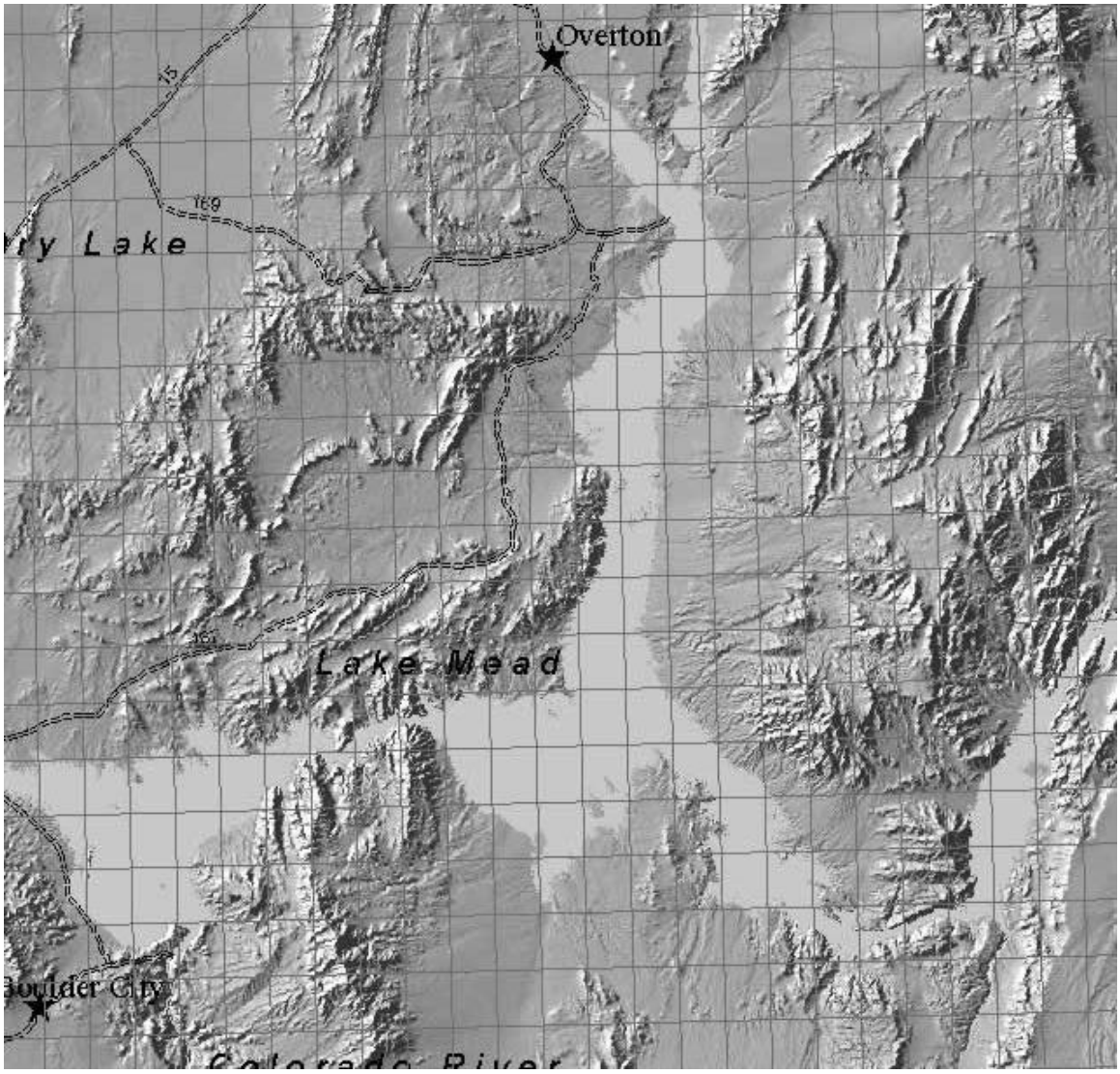
Some areas have significant and dense vegetation. Especially secretive marshbirds will likely be undercounted.

Pilot Studies Needed

Possibly. Need assessment to get better delineation of Type I and II habitats, but this may only involve reviewing the results of previous surveys.

Contacts with Local Knowledge: Terese Werst of Red Rock Audubon Society; Debbie Van Dooremolen of Southern Nevada Water Authority.

4. Lake Mead



Boundaries and Ownership

Lake Mead is located within the boundaries of Lake Mead National Recreation Area, a unit of the National Park Service. Legal boundaries of the park are described in the park's enabling legislation, which references a boundary map, RA_LM_7060-B, revised July 17, 1963, on file in the office of the National Park Service of the Department of the Interior. For purposes of this profile, the extensive terrestrial habitat of the park is not included, nor is Lake Mohave which, although part of the recreation area, is treated as a separate unit. Lake Mead, formed by Hoover Dam, is approximately 150,000 acres in size, depending on water levels, and includes roughly 700 miles of shoreline. The Colorado River flows into Lake Mead at the Lake Mead-Grand Canyon boundary. The Muddy and Virgin Rivers flow into the lake from the north. A portion of the border

between southern Nevada and northwestern Arizona lies within the lake itself. All of Lake Mead is managed by the National Park Service, Lake Mead National Recreation Area.

Focal Species

Eared Grebe
Pied-billed Grebe
Clark's Grebe
Western Grebe
Double-crested Cormorant
Black-crowned Night Heron
Great Blue Heron
Canada Goose
Mallard
Gadwall
Green-winged Teal
American Wigeon
Northern Shoveler
Cinnamon Teal
Canvasback
Redhead
Ring-necked Duck
Lesser Scaup
Common Goldeneye
Bufflehead
Common Merganser
Red-breasted Merganser
Ruddy Duck
Northern Harrier
Virginia Rail
Sora
American Coot
Killdeer
Spotted Sandpiper
Ring-billed Gull
California Gull
Marsh Wren
Common Yellowthroat
Yellow-headed Blackbird
Red-winged Blackbird

Location of Type I Habitat

Las Vegas Bay
Muddy River inflow
Virgin River inflow
Lake Mead delta

Location of Type II Habitat

Shorelines
Open Water

Access and Visibility

Habitat is accessible, but method of access will vary among individual sites. Changing lake levels may alter accessibility of sites through time. Bird visibility is generally good.

Past and Current Surveys

Lake Mead is surveyed annually for wintering bald eagles and nesting peregrine falcons. Surveys for southwestern willow flycatchers have been conducted on a limited basis. Formal surveys for waterfowl and shorebirds have not been conducted.

Potential Survey Methods

Description

All survey methods are feasible, but due to the size of the site, boat and aerial surveys are the most promising methods. The site needs to be subdivided with the help of local experts.

Selection bias

Changes in water levels may make previously accessible portions of Type I habitat much harder to survey.

Measurement error and bias

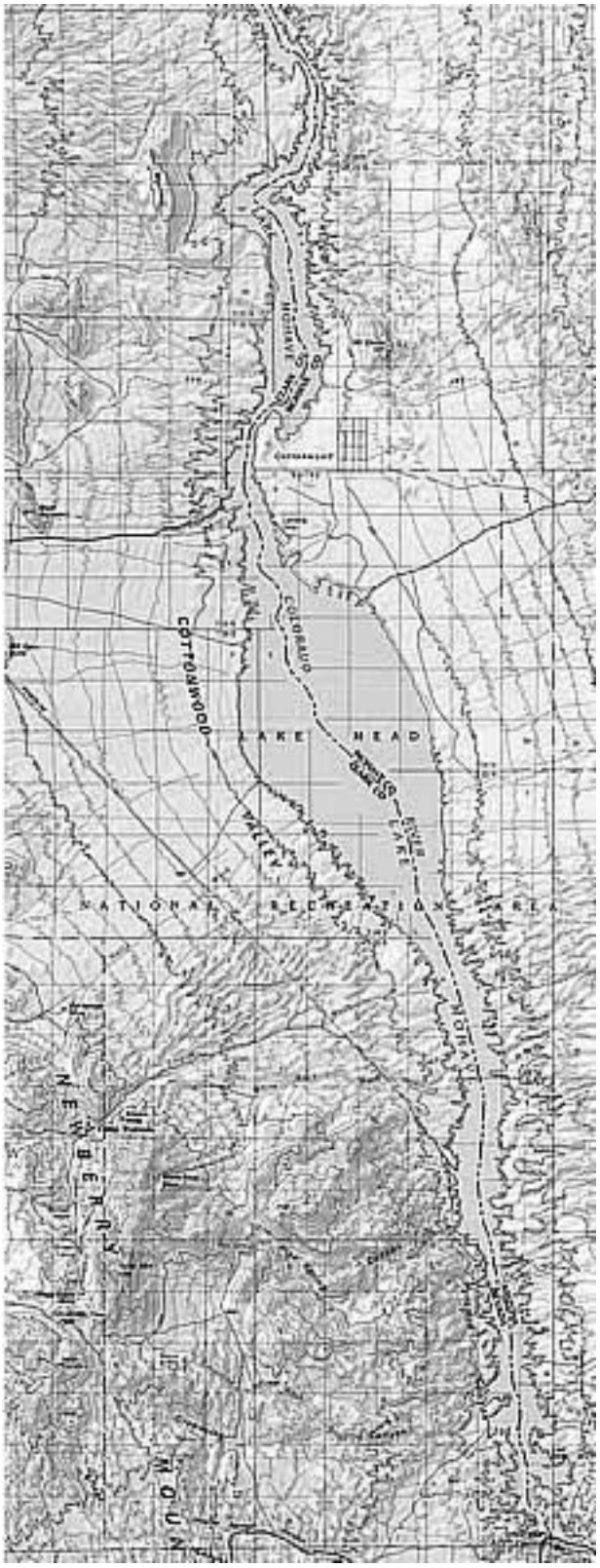
Size of the site may in itself cause error, because of double counting and difficulty of achieving systematic coverage. Observer variability may occur if high abundances and high species richness pose a challenge to skills.

Pilot Studies Needed

Given the large area being considered, pilot studies may be useful to identify additional areas of Type I habitat.

Contact with Local Knowledge: Ross Haley, NPS.

5. Lake Mohave



Boundaries and Ownership
Lake Mohave is located within the boundaries of Lake Mead National Recreation Area, a unit of the National Park Service. Legal boundaries of the park are described in the park's enabling legislation, which references a boundary map, RA_LM_7060-B, revised July 17, 1963, on file in the office of the National Park Service of the Department of the Interior. Lake Mohave is defined as all aquatic habitat existing between Hoover Dam at the north end and Davis Dam at the south end. Lake Mohave is approximately 28,000 acres in size and includes roughly 250 miles of shoreline. The site is managed by National Park Service, Lake Mead National Recreation Area.

Focal Species
Eared Grebe
Pied-billed Grebe
Clark's Grebe
Western Grebe
Double-crested Cormorant
Black-crowned Night Heron
Great Blue Heron
Canada Goose
Mallard
Gadwall
Green-winged Teal
American Wigeon
Northern Shoveler
Cinnamon Teal
Canvasback
Redhead
Ring-necked Duck
Lesser Scaup
Common Goldeneye
Bufflehead
Common Merganser
Red-breasted Merganser
Ruddy Duck
Northern Harrier
Virginia Rail
Sora
American Coot
Killdeer
Spotted Sandpiper
Ring-billed Gull
California Gull
Marsh Wren
Common Yellowthroat
Yellow-headed Blackbird
Red-winged Blackbird

Location of Type I Habitat
Black Canyon
Selected coves with extensive riparian plant growth

Location of Type II Habitat
Shorelines
Open Water

Access and Visibility
The site is about 1 ½ hours south of Las Vegas. All Type I habitat areas accessible, but method of access will vary among individual sites. Bird visibility is generally good.

Past and Current Surveys

Lake Mohave is surveyed annually for wintering bald eagles, nesting peregrine falcons, and southwestern willow flycatchers. Formal surveys for waterfowl and shorebirds have not been conducted.

Potential Survey Methods

Description

Survey methods that work best for Lake Mohave will likely be similar to, or the same as, those that work best for Lake Mead. The site should be subdivided into survey areas with the help of a local expert.

Selection bias

None

Measurement error and bias

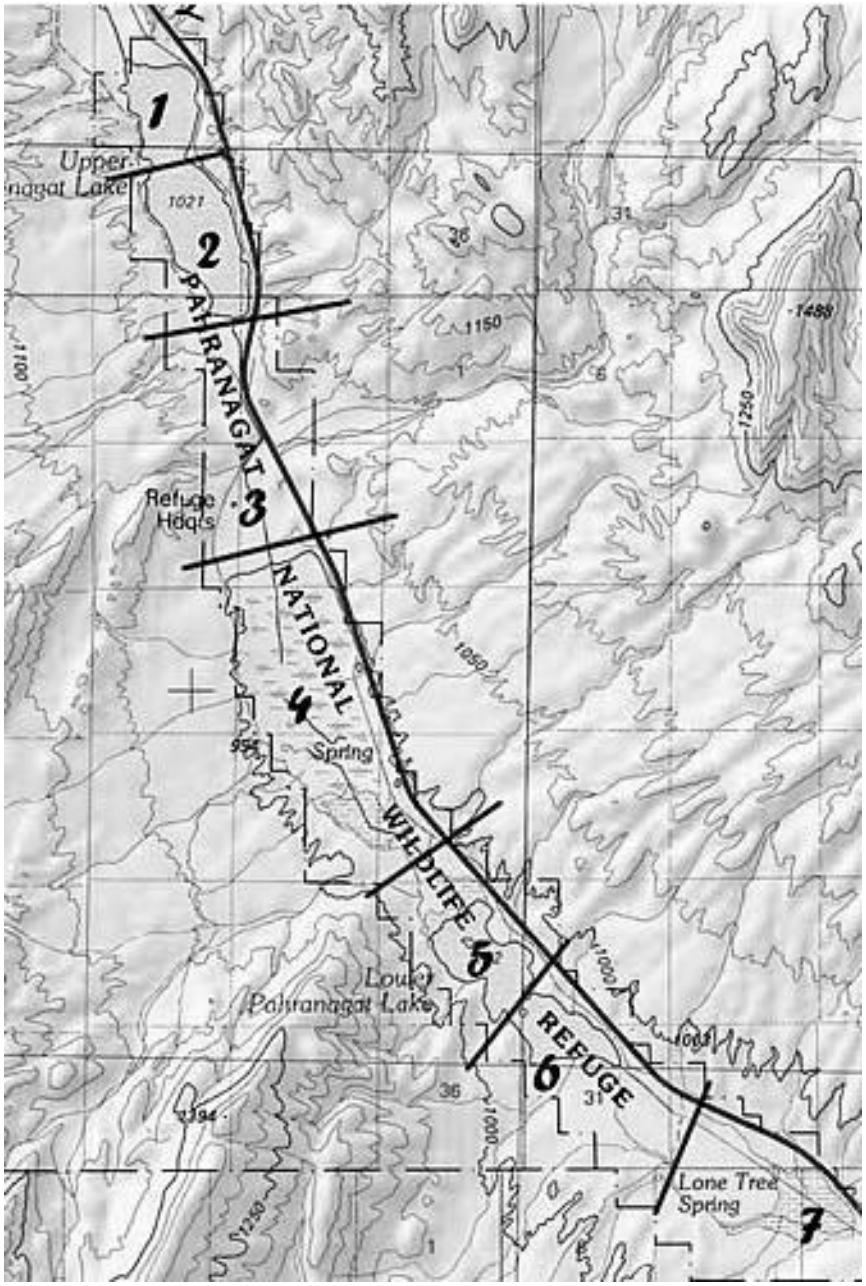
No unusual sources of error or bias, except that riparian vegetation may cause variability in detection of wetland birds.

Pilot Studies Needed

Given the large area being considered, pilot studies may be useful to better define areas of Type I habitat.

Contact with Local Knowledge: Ross Haley, NPS.

6. Pahranagat NWR



Boundaries and Ownership

West: T 7 S, R 61 E, S 27
South: T 9 S, R 62 E, S 3, 4, 5 and 6
East: T 9 S, R 62 E, S 3
North: T 9 S, R 61 E, S 27

The site's 5,380 acres are owned by the USFWS.

Focal Species

Pied-billed Grebe	Northern Pintail
Red-winged Blackbird	
Eared Grebe	Ruddy Duck
Great Blue Heron	Spotted Sandpiper
White-faced Ibis	Ring-billed Gull
Tundra Swan	California Gull
Canada Goose	Forester's Tern
Northern Shoveler	Marsh Wren
Gadwall	Common Yellowthroat

Location of Type I Habitat

North marsh
Middle pond (marsh)
Upper lake
Lower Lake (when water is available on the lake)

Location of Type II Habitat

Private Lands throughout Pahranagat Valley
Pahranagat – areas immediately south of Refuge Headquarters

Access and Visibility

The site is about 2 hours north of Las Vegas. Most areas are easily accessed due to WMA but access to private lands with Type II habitat needs to be obtained. Bird visibility is generally good, and birds can largely be identified across the whole lake from one shoreline.

Past and Current Surveys

Some historical waterfowl surveys.
MAPS Banding Station
Species occurrence and abundance list is available for the area.

Potential Survey Methods

Description

Ground surveys are likely the best strategy for this site, because access roads provide great view points of the lakes and wetlands, which are also small enough that most birds can be seen without much problem.

Selection bias

None

Measurement error and bias

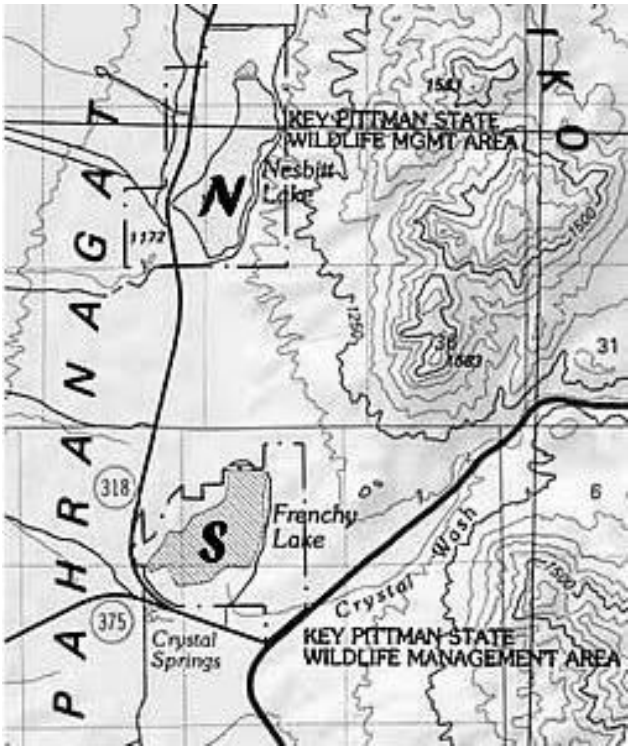
Visibility obstructed by emergent vegetation
Observer variability

Pilot Studies Needed

None

Contact with Local Knowledge: Cris Tomlinson of NDOW.

7. Key Pittman WMA



Boundaries and Ownership

West: T 4 S, R 60 E, S 27 and T 5 S, R 60 E, S 3 and 10
South: T 5 S, R 60 E, S 10 and 11
East: T 5 S, R 60 E, S 2 and 11
North: T 4 S, R 60 E, S 23
NDOW manages all 1,334 acres.

Focal Species

Pied-billed Grebe	Northern Pintail
Red-winged Blackbird	
Eared Grebe	Ruddy Duck
Great Blue Heron	Spotted Sandpiper
White-faced Ibis	Ring-billed Gull
Tundra Swan	California Gull
Canada Goose	Forester's Tern
Northern Shoveler	Marsh Wren
Gadwall	Common Yellowthroat

Location of Type I Habitat

Nesbitt Lake
Frenchy Lake (when water is available)

Location of Type II Habitat
Private Lands throughout Pahranagat Valley

Access and Visibility
The site is about 2 1/2 hours north of Las Vegas. Most areas are easily accessed due to WMA but access to private lands with Type II habitat needs to be obtained. Bird visibility is generally good, and birds can be identified across the whole lake from one shoreline.

Past and Current Surveys
Historical bi-monthly waterfowl surveys by NDOW.
Some recent documentation of spring and summer occurrence and breeding status of waterbirds, shorebirds and other birds (NDOW 1999-2002)

Potential Survey Methods

Description
Ground surveys are likely the best strategy for this site, because access roads provide great view points of the lakes and wetlands, which are also small enough that most birds can be seen without much problem.

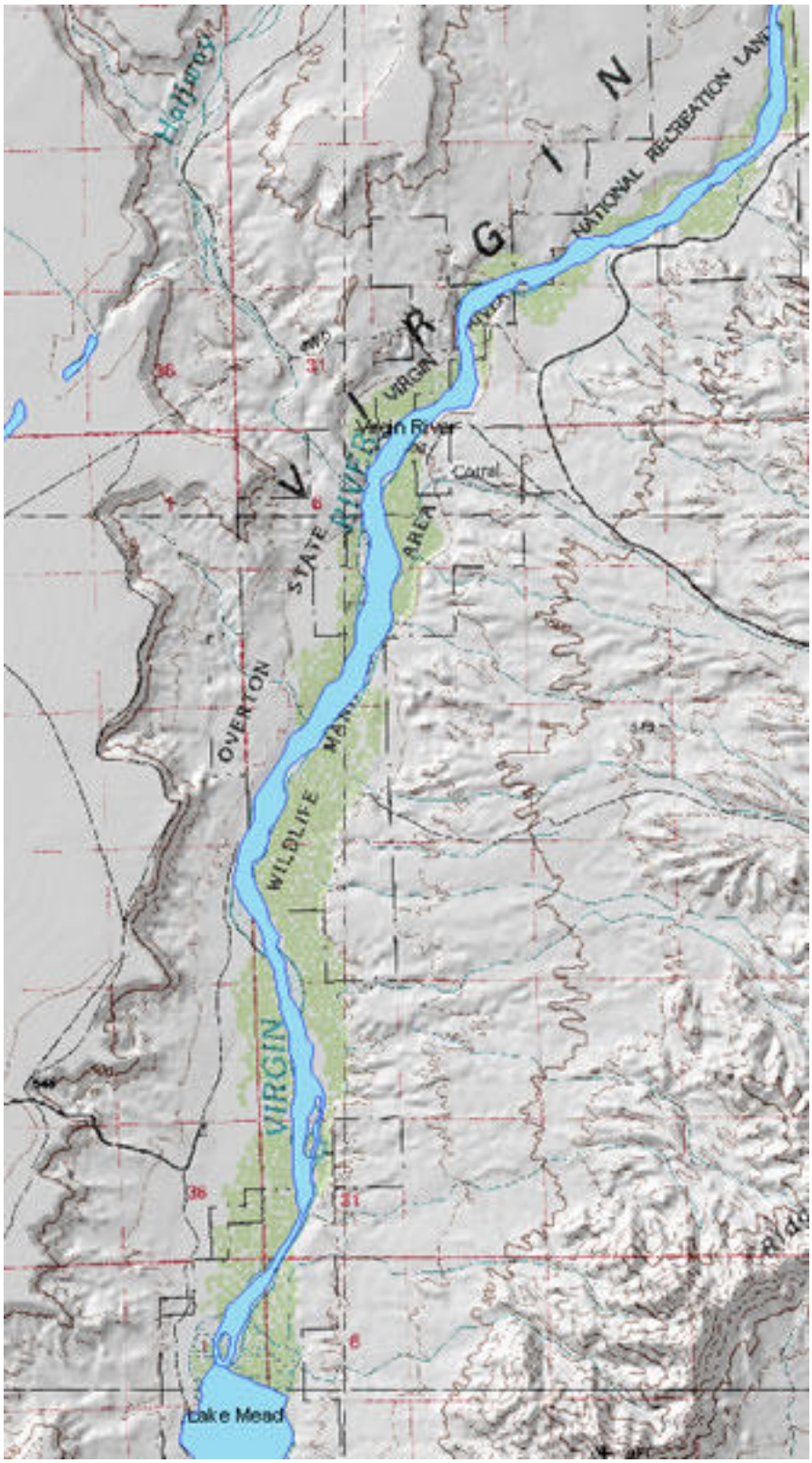
Selection bias
None, except possibly in some Type II habitat due to private lands.

Measurement error and bias
Visibility can be obstructed by emergent vegetation, but otherwise no unusual sources of error or bias.

Pilot Studies Needed
None.

Contact with Local Knowledge: Cris Tomlinson, NDOW.

8. Lower Virgin River (needs to be completed)



Boundaries and Ownership

Focal Species

Location of Type I Habitat

Location of Type II Habitat

Access and Visibility

Past and Current Surveys

Potential Survey Methods

Description

Selection bias

Measurement error and bias

Pilot Studies Needed

Contact with Local Knowledge:

9. Lower Colorado River (needs to be completed)

Boundaries and Ownership

Focal Species

Location of Type I Habitat

Location of Type II Habitat

Access and Visibility

Past and Current Surveys

Potential Survey Methods

Description

Selection bias

Measurement error and bias

Pilot Studies Needed

Contact with Local Knowledge:

Stratum 2: Southern Nevada

(*to be completed*)